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INSTALLATION RESTORATION PROGRAM

REMEDIAL INVESTIGATION
REPORT

MINNESOTA AIR NATIONAL GUARD BASE
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA

VOLUME 6

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The report describes the remedial actions performed on sites confirmed to contain hazardous waste contamination which endangers the human health. The actions performed are described and the potential for future problems. The study was conducted under the Air National Guard's Installation Restoration Program.

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Prepared By
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REMEDIAL ACTIONS PROGRAM**
Oak Ridge, Tennessee

Submitted To
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PREFACE

Engineering-Science (ES) entered into an agreement with the HAZWRAP Support Contractor office operated by Martin Marietta Energy Systems, Inc. for the U.S. Department of Energy (DOE) to perform a Remedial Investigation at the Minnesota Air National Guard Base, Duluth International Airport, Duluth, Minnesota, to be submitted to the National Guard Bureau, Andrews Air Force Base, Maryland. This investigation was initiated in July, 1988 under Task Order Y02, General Order 18B-97387C, which is under DOE contract DE-AC05-84OR21400, with Martin Marietta Energy Systems under Interagency Agreement 1489-1489-A1. The overall objectives of this effort were to define the magnitude, extent, direction, and rate of movement of identified contaminants and to summarize the need for remedial actions based on an assessment of risks to human health and the environment.

This investigation was performed by Engineering-Science personnel from the Oak Ridge, Tennessee office with oversight provided by Martin Marietta Energy Systems. Mr. Larry Janssen, of Martin Marietta Energy Systems was the Technical Monitor for Lt. Col. Michael Washeleski of the National Guard Bureau. Major Joel D. Manns, Minnesota Air National Guard Base, Duluth, Minnesota, provided field support. Engineering-Science personnel included Mr. Robert S. McLeod, P.E., P.G., who served as Project Manager and Mr. John D. Hardeman, P.G., who served as the Field Team Leader. Mr. Robert L. Thoem, P.E. was the ES Technical Director for the project.

Engineering-Science wishes to acknowledge North Star Drilling, Little Falls, Minnesota as the drilling and well installation subcontractor. Salo Engineering, Duluth, Minnesota, provided professional surveying services. ES Berkeley Laboratory, Berkeley, California; ES Atlanta Laboratory, Atlanta, Georgia; MetaTrace, Inc., St. Louis, Missouri; NUS Corporation, Pittsburgh, Pennsylvania; and IT Radiological Sciences Laboratory, Oak Ridge, TN provided analytical laboratory services for sample analyses.

This work was accomplished between July 1988 and March 1989.

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TABLE OF CONTENTS

VOLUME I

	Page
LIST OF FIGURES	xvii
LIST OF TABLES	xxvii
EXECUTIVE SUMMARY	ES-1
SECTION 1 INTRODUCTION	1-1
1.1 PURPOSE OF REPORT	1-4
1.1.1 Description of Installation Restoration Program	1-4
1.1.2 Report Organization	1-6
1.2 BACKGROUND OF DULUTH AIR NATIONAL GUARD BASE	1-7
1.2.1 Description of Duluth Air National Guard Base	1-7
1.2.1.1 Physiography, Climate and Drainage	1-10
1.2.1.2 Demography and Land Use	1-13
1.2.1.3 Geology	1-16
1.2.1.4 Hydrogeology	1-17
1.2.1.5 Water Quality	1-18
1.2.1.6 Water Use	1-18
1.2.2 History of Duluth Air National Guard Base	1-26
1.2.3 Previous Investigations	1-26
1.2.4 Description and History of Site 2	1-30
1.2.4.1 Description	1-30
1.2.4.2 History	1-31
1.2.4.3 Previous Investigations	1-33
1.2.5 Description and History of Site 3	1-37
1.2.5.1 Description	1-37
1.2.5.2 History	1-43
1.2.5.3 Previous Investigations	1-43
1.2.6 Description and History of Site 4	1-45
1.2.6.1 Description	1-53
1.2.6.2 History	1-53
1.2.6.3 Previous Investigations	1-53
1.2.7 Description and History of Site 8	1-62
1.2.7.1 Description	1-62
1.2.7.2 History	1-62
1.2.7.3 Previous Investigations	1-62

TABLE OF CONTENTS (continued)
VOLUME 1 (continued)

	Page
1.2.8 Description and History of Site 10	1-68
1.2.8.1 Description	1-68
1.2.8.2 History	1-72
1.2.8.3 Previous Investigations	1-72
SECTION 2 REMEDIAL INVESTIGATION DESCRIPTION	2-1
2.1 AREA LOCATIONS	2-3
2.1.1 Surface Feature Investigation	2-9
2.1.2 Surface Water and Sediment Investigations	2-9
2.1.2.1 Background Surface Drainage Location	2-9
2.1.2.2 Airport Surface Drainage Locations	2-9
2.1.3 Geological Investigation	2-12
2.1.4 Soil Investigation	2-12
2.1.5 Ground-Water Investigation	2-12
2.1.5.1 Water Level Investigation	2-12
2.1.5.2 Ground-Water Sampling Investigation	2-15
2.2 SITE 2	2-15
2.2.1 Surface Feature Investigation	2-20
2.2.2 Surface Water and Sediment Investigations	2-20
2.2.3 Geologic Investigation	2-20
2.2.4 Soil Investigation	2-20
2.2.5 Ground-Water Investigation	2-23
2.2.5.1 Aquifer Investigation	2-23
2.2.5.2 Ground-Water Sampling Investigation	2-25
2.3 SITE 3	2-25
2.3.1 Surface Feature Investigation	2-31
2.3.2 Surface Water and Sediment Investigations	2-31
2.3.3 Geologic Investigation	2-36
2.3.4 Soil Investigations	2-36

TABLE OF CONTENTS (continued)
VOLUME 1 (continued)

	Page
2.3.5 Ground-Water Investigation	2-38
2.3.5.1 Aquifer Investigation	2-38
2.3.5.2 Ground-Water Sampling Investigation	2-41
2.4 SITE 4	2-41
2.4.1 Surface Feature Investigation	2-47
2.4.2 Surface Water and Sediment Investigations	2-47
2.4.3 Geologic Investigation	2-47
2.4.4 Soil Investigation	2-50
2.4.5 Ground-Water Investigation	2-50
2.4.5.1 Aquifer Investigation	2-50
2.4.5.2 Ground-Water Sampling Investigation	2-50
2.5 SITE 8	2-53
2.5.1 Surface Feature Investigation	2-60
2.5.2 Surface Water and Sediment Investigations	2-60
2.5.3 Geologic Investigation	2-60
2.5.4 Soil Investigations	2-63
2.5.5 Ground-Water Investigation	2-63
2.5.5.1 Aquifer Investigation	2-63
2.5.5.2 Ground-Water Sampling Investigation	2-66
2.6 SITE 10	2-66
2.6.1 Surface Feature Investigation	2-66
2.6.2 Ground-Water Investigation	2-66
2.6.2.1 Aquifer Investigation	2-69
2.6.2.2 Ground-Water Sampling Investigation	2-69
SECTION 3 INVESTIGATION RESULTS	3-1
3.1 AREA LOCATIONS	3-3
3.1.1 Surface Features	3-3
3.1.2 Surface Water Hydrology	3-3

TABLE OF CONTENTS (continued)
VOLUME 1 (continued)

	Page
3.1.3 Geology	3-7
3.1.4 Hydrogeology	3-11
3.2 SITE 2	3-11
3.2.1 Surface Features	3-11
3.2.2 Surface Water Hydrology	3-18
3.2.3 Geology	3-21
3.2.4 Hydrogeology	3-22
3.3 SITE 3	3-29
3.3.1 Surface Features	3-29
3.3.2 Surface Water Hydrology	3-30
3.3.3 Geology	3-30
3.3.4 Hydrogeology	3-32
3.4 SITE 4	3-41
3.4.1 Surface Features	3-41
3.4.2 Surface Water Hydrology	3-41
3.4.3 Geology	3-43
3.4.4 Hydrogeology	3-44
3.5 SITE 8	3-48
3.5.1 Surface Features	3-50
3.5.2 Surface Water Hydrology	3-50
3.5.3 Geology	3-50
3.5.4 Hydrogeology	3-53
3.6 SITES 3, 4, 8	3-56
3.6.1 Surface Features	3-56
3.6.2 Surface Water Hydrology	3-56

TABLE OF CONTENTS (continued)
VOLUME 1 (continued)

	Page
3.6.3 Geology	3-65
3.6.4 Hydrogeology	3-67
3.7 SITE 10	3-72
3.7.1 Surface Features	3-72
3.7.2 Surface Water Hydrology	3-78
3.7.3 Geology	3-78
3.7.4 Hydrogeology	3-78
SECTION 4 NATURE AND EXTENT OF CONTAMINATION	4-1
4.1 DEFINITION OF BACKGROUND CONDITIONS	4-3
4.1.1 Surface Water and Sediment Quality	4-4
4.1.2 Soil Quality	4-4
4.1.3 Ground-Water Quality	4-4
4.2 AIRPORT AREA SURFACE WATER AND SEDIMENT SAMPLES	4-8
4.2.1 Airport Area Surface Water and Sediment Quality	4-8
4.2.2 Extent of Airport Area Contamination	4-11
4.3 NATURE AND EXTENT OF CONTAMINATION AT SITE 2	4-11
4.3.1 Source of Contamination	4-14
4.3.2 Surface Water and Sediment Contamination	4-14
4.3.2.1 Surface Water and Sediment Quality	4-14
4.3.2.2 Extent of Surface Water and Sediment Contamination	4-14
4.3.3 Soil Contamination	4-17
4.3.3.1 Soil Quality	4-17
4.3.3.2 Extent of Soil Contamination	4-21
4.3.4 Ground-Water Contamination	4-21
4.3.4.1 Ground-Water Quality	4-21
4.3.4.2 Extent of Ground-water Contamination	4-24

TABLE OF CONTENTS (continued)
VOLUME 1 (continued)

	Page
4.4 NATURE AND EXTENT OF CONTAMINATION AT SITE 3	4-29
4.4.1 Source of Contamination	4-29
4.4.2 Soil Gas Survey Results	4-29
4.4.3 Surface Water and Sediment Contamination	4-29
4.4.3.1 Surface Water and Sediment Quality	4-30
4.4.3.2 Extent of Surface Water and Sediment Contamination	4-35
4.4.4 Soil Contamination	4-35
4.4.4.1 Soil Quality	4-35
4.4.4.2 Extent of Soil Contamination	4-43
4.4.5 Ground-Water Contamination	4-44
4.4.5.1 Ground-Water Quality	4-44
4.4.5.2 Extent of Ground-Water Contamination	4-46
4.5 NATURE AND EXTENT OF CONTAMINATION AT SITE 4	4-51
4.5.1 Source of Contamination	4-51
4.5.2 Surface Water and Sediment Contamination	4-51
4.5.2.1 Surface Water and Sediment Quality	4-51
4.5.2.2 Extent of Sediment and Surface Water Contamination	4-56
4.5.3 Soil Contamination	4-60
4.5.3.1 Soil Quality	4-60
4.5.3.2 Extent of Soil Contamination	4-60
4.5.4 Ground-Water Contamination	4-60
4.5.4.1 Ground-Water Quality	4-62
4.5.4.2 Extent of Ground-Water Contamination	4-62
4.6 NATURE AND EXTENT OF CONTAMINATION AT SITE 8	4-62
4.6.1 Source of Contamination	4-64
4.6.2 Surface Water and Sediment Contamination	4-64
4.6.2.1 Surface Water and Sediment Quality	4-64
4.6.2.2 Extent of Surface Water and Sediment Contamination	4-64

TABLE OF CONTENTS (continued)
VOLUME 1 (continued)

	Page
4.6.3 Soil Contamination	4-64
4.6.3.1 Soil Quality	4-64
4.6.3.2 Extent of Soil Contamination	4-69
4.6.4 Ground-Water Contamination	4-69
4.6.4.1 Ground-Water Quality	4-69
4.6.4.2 Extent of Ground-Water Contamination	4-69
4.7 NATURE AND EXTENT OF CONTAMINATION AT SITE 10	4-72
4.7.1 Source of Contamination	4-72
4.7.2 Ground-Water Contamination	4-72
4.7.2.1 Ground-Water Quality	4-72
4.7.2.2 Extent of Ground-Water Contamination	4-75
SECTION 5 CONTAMINANT FATE AND TRANSPORT	5-1
5.1 Introduction	5-3
5.1.1 Contaminant Fate	5-3
5.1.2 Contaminant Transport	5-5
5.2 CONTAMINANT FATE AND TRANSPORT AT SITE 2	5-7
5.2.1 Summary of Contaminants	5-7
5.2.2 Potential Routes of Migration	5-7
5.2.3 Contaminant Persistence	5-8
5.2.4 Contaminant Mobility and Migration	5-9
5.2.4.1 Contaminant Migration in Surface Water	5-9
5.2.4.2 Contaminant Migration in Soil	5-9
5.2.4.3 Contaminant Migration in Ground Water	5-9
5.3 CONTAMINANT FATE AND TRANSPORT AT SITE 3	5-10
5.3.1 Summary of Contaminant	5-11
5.3.2 Potential Routes of Migration	5-11
5.3.3 Contaminant Persistence	5-12
5.3.4 Contaminant Mobility and Migration	5-13
5.3.4.1 Contaminant Migration in Surface Water	5-13
5.3.4.2 Contaminant Migration in Soil	5-13
5.3.4.3 Contaminant Migration in Ground Water	5-14

TABLE OF CONTENTS (continued)
VOLUME 1 (continued)

	Page
5.4 CONTAMINANT FATE AND TRANSPORT AT SITE 4	5-15
5.4.1 Summary of Contaminants	5-15
5.4.2 Potential Routes of Migration	5-16
5.4.3 Contaminant Persistence	5-16
5.4.4 Contaminant Migration in Surface Water and Ground Water	5-17
5.5 CONTAMINANT FATE AND TRANSPORT AT SITE 8	5-17
5.5.1 Summary of Contaminants	5-17
5.5.2 Potential Routes of Migration	5-17
5.5.3 Contaminant Persistence	5-17
5.5.4 Contaminant Mobility and Migration in Soil	5-18
5.6 CONTAMINANT FATE AND TRANSPORT AT SITE 10	5-18
5.6.1 Summary of Contaminants	5-18
5.6.2 Potential Routes of Migration	5-18
5.6.3 Contaminant Persistence	5-18.
5.6.4 Contaminant Mobility and Migration	5-18
SECTION 6 RISK ASSESSMENT	6-1
6.1 EVALUATION METHODOLOGY	6-3
6.1.1 Step 1 Selection of Indicator Chemicals	6-5
6.1.2 Step 2 Estimation of Exposure Point Concentrations	6-9
6.1.2.1 Exposure Pathway Analysis	6-9
6.1.2.2 Exposure Point Concentrations	6-11
6.1.2.3 Applicable and Appropriate Requirements and Other Criteria	6-17
6.1.3 Step 3 Estimation of Chemical Intakes	6-21
6.1.3.1 Fugitive Dust Generation Resulting from Wind Erosion	6-22

TABLE OF CONTENTS (continued)
VOLUME 1 (continued)

	Page
6.1.3.2 Volatilization of Organic Compounds from Surface Water	6-24
6.1.3.3 Dermal Contact with Surface Water	6-27
6.1.3.4 Ingestion of Surface Water During Recreation	6-29
6.1.3.5 Ingestion of Ground Water as Drinking Water	6-30
6.1.3.6 Ingestion of Soil	6-31
6.1.4 Step 4 Toxicity Assessment	6-32
6.1.5 Step 5 Risk Characterization	6-34
6.1.5.1 Noncarcinogenic Effects	6-34
6.1.5.2 Potential Carcinogenic Effects	6-35
6.2 SITE 2 RISK ASSESSMENT	6-36
6.2.1 Selection of Indicator Chemicals	6-36
6.2.2 Estimation of Exposure Point Concentrations or Emission Rates	6-38
6.2.2.1 Exposure Pathway Analysis	6-38
6.2.2.2 Exposure Point Concentrations	6-41
6.2.2.3 Comparison of Exposure Point Concentrations to ARARs	6-42
6.2.3 Estimation of Chemical Intakes	6-44
6.2.4 Toxicity Assessment	6-44
6.2.5 Risk Characterization	6-45
6.2.5.1 Risk Characterization of Noncarcinogenic Compounds	6-45
6.2.5.2 Risk Characterization of Potentially Carcinogenic Compounds	6-45
6.3 SITE 3 RISK ASSESSMENT	6-50
6.3.1 Selection of Indicator Chemicals	6-50
6.3.2 Estimation of Exposure Point Concentrations or Emission Rates	6-50
6.3.2.1 Exposure Pathway Analysis	6-52
6.3.2.2 Exposure Point Concentrations	6-55
6.3.2.3 Comparison of Exposure Point Concentrations to ARARs	6-56
6.3.3 Estimation of Chemical Intakes	6-58
6.3.4 Toxicity Assessment	6-58

TABLE OF CONTENTS (continued)
VOLUME 1 (continued)

	Page
6.3.5 Risk Characterization	6-59
6.3.5.1 Risk Characterization of Noncarcinogenic Compounds	6-59
6.3.5.2 Risk Characterization of Potentially Carcinogenic Compounds	6-59
6.4 SITE 4 RISK ASSESSMENT	6-62
6.4.1 Selection of Indicator Chemicals	6-62
6.4.2 Estimation of Exposure Point Concentrations or Emission Rates	6-62
6.4.2.1 Exposure Pathway Analysis	6-62
6.4.2.2 Exposure Point Concentrations	6-69
6.4.2.3 Comparison of Exposure Point Concentrations to ARARs	6-71
6.4.3 Estimation of Chemical Intakes	6-72
6.4.4 Toxicity Assessment	6-72
6.4.5 Risk Characterization	6-72
6.4.5.1 Risk Characterization of Noncarcinogenic Compounds	6-73
6.4.5.2 Risk Characterization of Potentially Carcinogenic Compounds	6-73
6.5 SITE 8 RISK ASSESSMENT	6-73
6.5.1 Selection of Indicator Chemicals	6-73
6.5.2 Estimation of Exposure Point Concentrations or Emission Rates	6-73
6.5.2.1 Exposure Pathway Analysis	6-79
6.5.2.2 Exposure Point Concentrations	6-82
6.5.2.3 Comparison of Exposure Point Concentrations to ARARs	6-82
6.5.3 Estimation of Chemical Intakes	6-83
6.5.4 Toxicity Assessment	6-83
6.5.5 Risk Characterization	6-84
6.5.5.1 Risk Characterization of Noncarcinogenic Compounds	6-84
6.5.5.2 Risk Characterization of Potentially Carcinogenic Compounds	6-86
6.6 SUMMARY AND CONCLUSIONS	6-86

TABLE OF CONTENTS (continued)
VOLUME 1 (continued)

	Page
SECTION 7 SUMMARY AND RECOMMENDATIONS	7-1
7.1 INTRODUCTION	7-1
7.2 SIGNIFICANT CONTAMINATION AT SITE 2	7-8
7.3 SIGNIFICANT CONTAMINATION AT SITE 3	7-9
7.4 SIGNIFICANT CONTAMINATION AT SITE 4	7-11
7.5 SIGNIFICANT CONTAMINATION AT SITE 8	7-12
7.6 SIGNIFICANT CONTAMINATION AT SITE 10	7-12
7.7 SUMMARY OF SIGNIFICANT CONTAMINATION AT ALL SITES	7-12
7.8 RECOMMENDATIONS	7-13
SECTION 8 REFERENCES	8-1

VOLUME 2

APPENDIX A	DEFINITIONS, NOMENCLATURE AND UNITS OF MEASUREMENT
APPENDIX B	STATEMENT OF WORK
APPENDIX C	PROJECT TEAM BIOGRAPHICAL SUMMARIES
APPENDIX D	PROCEDURES AND PROTOCOLS
APPENDIX E	DRILLING RECORDS
APPENDIX F	WELL CONSTRUCTION RECORDS
APPENDIX G	AQUIFER SLUG TEST ANALYSIS
APPENDIX H	ALTITUDE AND COORDINATE SURVEY FOR SAMPLING SITES
APPENDIX I	GROUND-WATER LEVEL MEASUREMENT SUMMARY
APPENDIX J	STREAMFLOW MEASUREMENT SUMMARY
APPENDIX K	GRAIN SIZE ANALYSES
APPENDIX L	CHEMICAL ANALYSES RESULTS FOR SOIL, GROUND WATER, SURFACE WATER AND SEDIMENT SAMPLES

TABLE OF CONTENTS (continued)

VOLUME 3

APPENDIX M LABORATORY DATA AND QUALITY ASSURANCE
FORMS, DATA PACKAGES #1 THROUGH #12

VOLUME 4

APPENDIX M LABORATORY DATA AND QUALITY ASSURANCE
FORMS, DATA PACKAGES #13 THROUGH #25

VOLUME 5

APPENDIX M LABORATORY DATA AND QUALITY ASSURANCE
FORMS, DATA PACKAGES #26 THROUGH #41

→ Volume 6 of this report consists of
~~VOLUME 6~~

→ APPENDIX M: LABORATORY DATA AND QUALITY ASSURANCE
FORMS, DATA PACKAGES #42 THROUGH #68

VOLUME 7

APPENDIX N QA REPORT FOR SAMPLE ANALYSES RESULTS

APPENDIX O SOIL GAS RESULTS

APPENDIX P RISK ASSESSMENT TABLES

APPENDIX Q FIELD NOTEBOOKS AND DRILLING LOGS

→ Included is information obtained from sampling
of water wells and ground water and listed
in data tables. Data of pesticides and
chemical contamination found in soils and in
runoff from watersheds is also listed. →

LIST OF FIGURES

	Page
1-1 Location Map.	1-8
1-2 Site Vicinity Map.	1-9
1-3 Airport Configuration.	1-12
1-4 St. Louis River Watershed.	1-15
1-5 Location Scheme for Water Wells in the State of Minnesota.	1-20
1-6 Sites Defined and Ranked During IRP Phase I Study.	1-29
1-7 Aerial Photograph of Site 2, April 1988.	1-32
1-8 Site 2 Sampling Locations Utilized During Phase II Investigations.	1-35
1-9 Aerial Photograph of Site 3, April 1988.	1-38
1-10 Site 3 Sampling Locations Utilized During Phase II Investigations.	1-47
1-11 Aerial Photograph of Site 4, April 1988.	1-54
1-12 Site 4 Sampling Locations Utilized During Phase II Investigations.	1-57
1-13 Aerial Photograph of Site 8, April 1988.	1-64
1-14 Site 8 Sampling Locations Utilized During Phase II, Stage 2 Investigations.	1-65
1-15 Site 10 Aerial Photograph, April 1988.	1-70
1-16 Site 10 Sampling Locations Utilized During Phase II, Stage 2 Investigation.	1-73
2-1 Airport Area Sampling Locations Utilized During Remedial Investigations.	2-5
2-2 Site 2 Boreholes, Surface Locations and Trenched Area of Remedial Investigation.	2-16
2-3 Site 2 Sampling Locations Utilized During Remedial Investigation.	2-17
2-4 Site 3 Boreholes, Surface Locations, and Surveyed Soil Gas Grid Points of Remedial Investigation.	2-26
2-5 Site 3 Soil Gas and Shallow Soil Sample Locations.	2-27

LIST OF FIGURES (continued)

	Page
2-6 Site 3 Monitoring Wells Utilized During Remedial Investigation.	2-28
2-7 Site 4 Sampling Locations Established During Remedial Investigation.	2-43
2-8 Site 4 Sampling Locations Utilized During Remedial Investigation.	2-44
2-9 Site 8 Sampling Locations Established During Remedial Investigation.	2-55
2-10 Site 8 Sampling Locations Utilized During Remedial Investigation.	2-56
3-1 Aerial Photograph of the Airport Area, August 1952.	3-5
3-2 Lithologic Logs From Paired Well Points at Site 2.	3-8
3-3 Lithologic Logs From Paired Well Points at Site 8.	3-9
3-4 Bedrock Contour Map of the Airport Area.	3-10
3-5 Geologic Cross-Sections of the Airport Area.	3-13
3-6 Index to Cross-Sections of the Airport Area.	3-14
3-7 Aerial Photograph of Site 2, August 1952.	3-15
3-8 Aerial Photograph of Site 2, October 1965.	3-16
3-9 Aerial Photograph of Site 2, May 1979.	3-17
3-10 Surface Drainage of Site 2.	3-20
3-11 Index to Cross-Section Locations for Site 2.	3-23
3-12 Geologic Cross-Sections for Site 2.	3-24
3-13 Water Table and Direction of Ground Water Movement at Site 2.	3-25
3-14 Variation in Vertical Hydraulic Head in the Glacial Till at Site 2 and Generalized Direction of Ground-Water Movement.	3-26
3-15 Surface Drainage of Site 3.	3-31
3-16 Index to Cross-Sections for Sites 3, 4, and 8.	3-34
3-17 Geologic Cross-Sections for Site 3.	3-35

LIST OF FIGURES (continued)

	Page
3-18 Water Table and Direction of Ground Water Movement for Site 3.	3-38
3-19 Variation in Vertical Hydraulic Head in the Glacial Till at Site 3 and Generalized Direction of Ground-Water Movement.	3-39
3-20 Surface Drainage at Site 4.	3-42
3-21 Geologic Cross-Sections for Site 4.	3-45
3-22 Water Table and Direction of Ground Water Movement for Site 4.	3-46
3-23 Variation in Vertical Hydraulic Head in the Glacial Till at Site 4 and Generalized Direction of Ground-Water Movement.	3-47
3-24 Surface Drainage at Site 8.	3-52
3-25 Geologic Cross-Sections at Site 8.	3-55
3-26 Water Table and Direction of Ground-Water Movement for Site 8.	3-58
3-27 Variation in Vertical Hydraulic Head in the Glacial Till at Site 8 and Generalized Direction of Ground-Water Movement.	3-59
3-28 Aerial Photograph of Sites 3, 4, and 8, April 1988.	3-60
3-29 Aerial Photograph of Sites 3, 4, and 8, August 1952.	3-61
3-30 Aerial Photograph of Sites 3, 4, and 8, October 1965.	3-62
3-31 Aerial Photograph of Sites 3, 4, and 8, May 1979.	3-63
3-32 Bedrock Contour Map of Sites 3, 4, and 8.	3-66
3-33 Geologic Cross-Section for Sites 3, 4 and 8.	3-69
3-34 Water Table and Direction of Ground-Water Movement for Sites 3, 4 and 8.	3-70
3-35 Variation in Vertical Hydraulic Head in the Glacial Till at Sites 3, 4 and 8, and Generalized Direction of Ground-Water Movement.	3-71
3-36 Aerial Photograph of Site 10, August 1952.	3-74
3-37 Aerial Photograph of Site 10, October 1965.	3-75

LIST OF FIGURES (continued)

	Page
3-38 Aerial Photograph of Site 10, May 1979.	3-76
3-39 Aerial Photograph of Site 10, April 1988 Showing Surface Drainage.	3-77
3-40 Water Table and Direction of Ground Water Movement for Site 10.	3-80
4-1 Estimated Areal Extent of Trichloroethene Contamination in Ground Water at Site 2.	4-25
4-2 Estimated Areal Extent of Trans-1,2-Dichloroethene Contamination in Ground Water at Site 2.	4-26
4-3 Distribution of Near Surface Soil Pesticide and PCB Occurrences at Site 3.	4-39
4-4 Estimated Areal Extent of Trichloroethene Contamination in Ground Water at Site 3.	4-48
4-5 Estimated Areal Extent of Tetrachloroethene Contamination in Ground Water at Site 3.	4-49
4-6 Estimated Areal Extent of 1,1,1 Trichloroethane Contamination in Ground Water at Site 3.	4-50
4-7 Vertical Distribution of Trichloroethene Contamination in Ground Water at Site 3	4-52
4-8 Vertical Distribution of Tetrachloroethene Contamination in Ground Water at Site 3.	4-53
4-9 Vertical Distribution of 1,1,1 Trichloroethane Contamination in Ground Water at Site 3.	4-54
4-10 Location of Pesticide and PCB Occurrences in Surface Soils at Site 8.	4-65

LIST OF TABLES

		Page
1-1	Climatic Data for Duluth International Airport	1-14
1-2	Well Data, 1-Mile Radius of Site, Duluth IAP, Duluth, Minnesota	1-21
1-3	Phase I Priority Ranking of Potential Contamination Sources ⁽¹⁾	1-28
1-4	Parameters Analyzed and Detected in Site 2 Ground Water Samples During the Phase II, Stage 1 Investigation	1-36
1-5	Parameters Analyzed in Site 2 Soil Samples During the Phase II, Stage 2 Investigation	1-39
1-6	Parameters Detected in Site 2 Soil Samples During the Phase II, Stage 2 Investigation	1-40
1-7	Parameters Analyzed in Site 2 Water Samples During the Phase II, Stage 2 Study	1-41
1-8	Parameters Detected in Site 2 Water Samples During the Phase II, Stage 2 Investigation	1-42
1-9	Parameters Detected in Site 3 Soil Samples During the Phase II, Stage 1 Investigation	1-44
1-10	Parameters Analyzed in Site 3 Soil and Sediment Samples During the Phase II, Stage 2 Investigation	1-48
1-11	Parameters Detected in Site 3 Soil Samples During the Phase II, Stage 2 Investigation	1-49
1-12	Parameters Detected in Site 3 Sediment Samples During the Phase II, Stage 2 Investigation	1-50
1-13	Parameters Analyzed in Site 3 Water Samples During the Phase II, Stage 2 Investigation	1-51
1-14	Parameters Detected in Site 3 Water Samples During the Phase II, Stage 2 Investigation	1-52
1-15	Parameters Analyzed and Detected in Site 4 Water Samples During the Phase II, Stage 1 Investigation	1-58
1-16	Parameters Analyzed in Site 4 Soil Samples During the Phase II, Stage 2 Investigation	1-59
1-17	Parameters Detected in Site 4 Soil Samples During the Phase II, Stage 2 Investigation	1-60
1-18	Parameters Detected in Site 4 Water Samples During the Phase II, Stage 2 Investigation	1-61

LIST OF TABLES (continued)

	Page
1-19 Parameters Analyzed in Site 8 Soil and Water Samples During the Phase II, Stage 2 Investigation	1-66
1-20 Parameters Detected in Site 8 Soil Samples During the Phase II, Stage 2 Investigation	1-67
1-21 Parameters Detected in Site 8 Water Samples During the Phase II, Stage 2 Investigation	1-71
1-22 Parameters Analyzed and Detected in Site 10 Ground-Water Samples During the Phase II, Stage 2 Investigation	1-74
2-1 Summary of Remedial Investigation Work by Site	2-6
2-2 Drilling and Sampling Summary	2-7
2-3 Summary of Work Performed at Area Locations	2-8
2-4 Chemical Analyses Performed on Background and Airport Area Surface Water Samples	2-10
2-5 Chemical Analyses Performed on Background and Airport Area Sediment Samples	2-11
2-6 Chemical Analyses Performed on Area Background Soil Samples	2-13
2-7 Summary of Water Level Measurement Rounds at Area Background Monitoring Wells	2-14
2-8 Chemical Analysis Performed on Area Background Ground-Water Samples	2-18
2-9 Summary of Work Performed at Site 2 Locations	2-19
2-10 Chemical Analyses Performed on Site 2 Surface Water Samples	2-21
2-11 Chemical Analyses Performed on Site 2 Sediment Samples	2-22
2-12 Chemical Analyses Performed on Site 2 Soil Samples	2-24
2-13 Summary of Site 2 Water Level Measurement Rounds	2-29
2-14 Chemical Analyses Performed on Site 2 Ground-Water Samples	2-30
2-15 Summary of Work Performed at Site 3 Locations	2-32
2-16 Chemical Analyses Performed on Site 3 Surface Water Samples	2-34
2-17 Chemical Analyses Performed on Site 3 Sediment Samples	2-35

LIST OF TABLES (continued)

	Page
2-18 Targeted Compounds for Soil Gas Analysis at Site 3	2-37
2-19 Chemical Analyses Performed on Site 3 Soil Samples	2-39
2-20 Summary of Site 3 Water Level Measurement Rounds	2-40
2-21 Chemical Analysis Performed on Site 3 Ground-Water Samples	2-45
2-22 Summary of Work Performed at Site 4 Locations	2-46
2-23 Chemical Analyses Performed on Site 4 Surface Water Samples	2-48
2-24 Chemical Analyses Performed on Site 4 Sediment Samples	2-49
2-25 Chemical Analyses Performed on Site 4 Soil Samples	2-51
2-26 Summary of Site 4 Water Level Measurement Rounds	2-52
2-27 Chemical Analyses Performed on Site 4 Ground-Water Samples	2-57
2-28 Summary of Work Performed at Site 8 Locations	2-58
2-29 Chemical Analyses Performed on Site 8 Surface Water Samples	2-61
2-30 Chemical Analyses Performed on Site 8 Sediment Samples	2-62
2-31 Chemical Analyses Performed on Site 8 Soil Samples	2-64
2-32 Summary of Site 8 Water Level Measurement Rounds	2-65
2-33 Chemical Analyses Performed on Site 8 Ground-Water Samples	2-67
2-34 Summary of Work Performed at Site 10 Locations	2-68
2-35 Summary of Site 10 Water Level Measurement Rounds	2-70
2-36 Chemical Analyses Performed on Site 10 Ground-Water Samples	2-71
3-1 Streamflow at Three Airport Area Locations	3-6
3-2 Hydraulic Parameters for Site 2	3-28
3-3 Summary of Site 3 Slug Test Results	3-40
3-4 Summary of Site 4 Slug Test Results	3-49
3-5 Summary of Site 8 Slug Test Results	3-64
4-1 Metals Detected in the Background Sediment Sample	4-5
4-2 Metals Detected in Background Soil Samples	4-6

LIST OF TABLES (continued)

	Page
4-3 Metals Detected in Background Ground-Water Samples	4-7
4-4 Radiological Parameters Detected in Background Ground-Water and Surface Water Samples	4-9
4-5 Temperature, pH and Specific Conductance Measurements for Background Location Water Samples	4-10
4-6 Metals Detected in Sediment at Airport Area Locations	4-12
4-7 Temperature, pH and Specific Conductance Measurements for Airport Area Surface Water Samples	4-13
4-8 Metals Detected in Site 2 Sediment Samples	4-15
4-9 Temperature, pH and Specific Conductance Measurements for Site 2 Water Samples	4-16
4-10 Volatile Organic Compounds Detected in Site 2 Soil Samples From Soil Sampling Boreholes	4-18
4-11 Semi-Volatile Organic Compounds Detected in Site 2 Soil Samples	4-19
4-12 Petroleum Hydrocarbons Detected in Site 2 Soil Samples	4-20
4-13 Metals Detected in Site 2 Soil Samples	4-22
4-14 Volatile Organic Compounds Detected in Site 2 Ground-Water Samples	4-27
4-15 Temperature, pH and Specific Conductance Measurements For Site 2 Water Samples	4-28
4-16 Volatile and Semi-Volatile Organic Compounds Detected in Site 3 Surface Water and Sediment Samples	4-31
4-17 Petroleum Hydrocarbons Detected in Site 3 Sediment and Soil Samples	4-32
4-18 Metals Detected in Site 3 Sediment Samples	4-33
4-19 Summary of Temperature, pH and Specific Conductance Measurements For Site 3 Water Samples	4-34
4-20 Volatile Organic Compounds Detected in Site 3 Soil Samples	4-36
4-21 Organochlorine Pesticides and PCBs Detected in Site 3 Soil and Ground-Water Samples	4-40

LIST OF TABLES (continued)

	Page
4-22 Metals Detected in Site 3 Soil Samples	4-41
4-23 Volatile Organic Compounds Detected in Site 3 Ground-Water Samples	4-45
4-24 Volatile Organic Compounds Detected in Site 4 Surface Water and Sediment Samples	4-55
4-25 Petroleum Hydrocarbons Detected in Site 4 Soil Samples	4-57
4-26 Metals Detected in Site 4 Sediment Samples	4-58
4-27 Temperature, pH and Specific Conductance Measurements For Site 4 Water Samples	4-59
4-28 Metals Detected in Site 4 Soil Samples	4-61
4-29 Metals Detected in Site 4 Ground-Water Samples	4-63
4-30 Metals Detected in Site 8 Sediments Samples	4-66
4-31 Temperature, pH and Specific Conductance Measurements For Site 8 Water Samples	4-67
4-32 Organochlorine Pesticides and PCBs Detected in Site 8 Soil Samples	4-68
4-33 Metals Detected in Site 8 Soil Samples	4-70
4-34 Metals Detected in Site 8 Ground-Water Samples	4-71
4-35 Summary of Radiological Results For Ground-Water Samples Taken at Site 10	4-73
4-36 Temperature, pH and Specific Conductance Measurements For Site 10 Water Samples	4-74
5-1 Summary of Chemical and Physical Properties For Organic Compounds Detected at Duluth ANGB ⁽¹⁾	5-4
6-1 Severity Ratings for Noncarcinogens	6-7
6-2 Weight-of-Evidence Categories For Potential Carcinogens	6-8
6-3 Indicator Chemicals and Relevant Physical Properties - Sites 2, 3, 4 and 8	6-10
6-4 Matrix of Potential Exposure Pathways	6-12

LIST OF TABLES (continued)

	Page
6-5 Applicable, Relevant and Appropriate Requirements and Other Criteria For Indicator Chemicals at Sites 2, 3, 4 and 8	6-19
6-6 Sites 2, 3, 4 and 8 Critical Toxicity Values	6-33
6-7 Site 2 Indicator Chemical Concentrations	6-37
6-8 Pathways Contributing to Total Exposure For Each Potential Receptor at Site 2	6-39
6-9 Comparison of Exposure Point Concentrations of Site 2 Indicator Chemicals in Air	6-43
6-10 Summary of Hazard Index Values For Site 2 - Upper Bound	6-46
6-11 Summary of Hazard Index Values For Site 2 - Best Estimate	6-47
6-12 Summary of Risk From Potential Carcinogens For Site 2 - Upper Bound	6-48
6-13 Summary of Risk From Potential Carcinogens For Site 2 - Best Estimate	6-49
6-14 Site 3 Indicator Chemical Concentrations	6-51
6-15 Pathways Contributing to Total Exposure For Each Potential Receptor at Site 3	6-53
6-16 Comparison of Ambient Exposure Point Concentrations With Air Criteria - Site 3	6-57
6-17 Summary of Hazard Index Values for Site 3 - Upper Bound	6-60
6-18 Summary of Hazard Index Values for Site 3 - Best Estimate	6-61
6-19 Summary of Risk From Potential Carcinogens for Site 3 - Upper Bound	6-63
6-20 Summary of Risk From Potential Carcinogens for Site 3 - Best Estimate	6-64
6-21 Site 4 Indicator Chemical Concentrations	6-65
6-22 Pathways Contributing to Total Exposure for Each Potential Receptor at Site 4	6-67
6-23 Comparison of Ambient Exposure Point Concentrations With Air Criteria - Site 4	6-70
6-24 Summary of Hazard Index Values For Site 4 - Upper Bound	6-74

LIST OF TABLES (continued)

	Page
6-25 Summary of Hazard Index Values for Site 4 - Best Estimate	6-75
6-26 Summary of Risk From Potential Carcinogens For Site 4 - Upper Bound	6-76
6-27 Summary of Risk From Potential Carcinogens For Site 4 - Best Estimate	6-77
6-28 Site 8 Indicator Chemical Concentrations	6-78
6-29 Pathways Contributing to Total Exposure For Each Potential Receptor at Site 8	6-80
6-30 Summary of Hazard Index Values For Site 8	6-85
6-31 Summary of Risk From Potential Carcinogens For Site 8	6-87
6-32 Summary of Hazard Index Values for Sites 2, 3, 4 and 8	6-88
6-33 Summary of Risk From Potential Carcinogens For Sites 2, 3, 4 and 8	6-89
6-34 Commonplace Risks	6-91
7-1 Summary of Surface Water Contaminants by Site	7-3
7-2 Summary of Sediment Contaminants by Site	7-6
7-3 Summary of Soil Contaminants by Site	7-7
7-4 Summary of Ground-Water Contaminants by Site	7-8
7-5 Summary of Findings by Site	7-16

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APPENDIX M
CONTINUED

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APPENDIX M

TABLE OF CONTENTS

	Page
M.1 INTRODUCTION	M-7
M.2 DATA PACKAGES	M-11
Data Package #1	13
Data Package #2	75
Data Package #3	119
Data Package #4	207
Data Package #5	251
Data Package #6	331
Data Package #7	377
Data Package #8	489
Data Package #9	533
Data Package #10	607
Data Package #11	675
Data Package #12	781
	VOLUME 4
Data Package #13	857
Data Package #14	917
Data Package #15	987
Data Package #16	1055
Data Package #17	1093
Data Package #18	1131
Data Package #19	1217
Data Package #20	1283
Data Package #21	1349
Data Package #22	1419
Data Package #23	1495
Data Package #24	1569
Data Package #25	1635
	VOLUME 5
Data Package #26	1679
Data Package #27	1749
Data Package #28	1773

APPENDIX M

TABLE OF CONTENTS(continued)

	Page
Data Package #29	1815
Data Package #30	1867
Data Package #31	1925
Data Package #32	1997
Data Package #33	2041
Data Package #34	2071
Data Package #35	2101
Data Package #36	2117
Data Package #37	2139
Data Package #38	2159
Data Package #39	2181
Data Package #40	2325
Data Package #41	2435
VOLUME 6	
Data Package #42	2493
Data Package #43	2537
Data Package #44	2549
Data Package #45	2569
Data Package #46	2603
Data Package #47	2655
Data Package #48	2701
Data Package #49	2719
Data Package #50	2739
Data Package #51	2749
Data Package #52	2785
Data Package #53	2851
Data Package #54	2863
Data Package #55	2907
Data Package #56	2953
Data Package #57	2991
Data Package #58	3009
Data Package #59	3061

APPENDIX M
TABLE OF CONTENTS(continued)

	Page
Data Package #60	3091
Data Package #61	3143
Data Package #62	3181
Data Package #63	3191
Data Package #66	3195
Data Package #67	3233
Data Package #68	3237

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DATA PACKAGE #42

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ENGINEERING-SCIENCE, INC.

RESEARCH AND DEVELOPMENT
LABORATORY
600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 841-7353

REVISED REPORT

Job No.: OR001

Work Order No.: 929

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the soil sample(s) received by this laboratory on 8-30-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88102186	DANGB-BG-MW32-SS1,2-3'	AS-F	8-29-88		10-10-88	
88102186	DANGB-BG-MW32-SS1,2-3'	BA-I	8-29-88		10-20-88	
88102186	DANGB-BG-MW32-SS1,2-3'	CD-F	8-29-88		10-20-88	
88102186	DANGB-BG-MW32-SS1,2-3'	CR-F	8-29-88		10-20-88	
88102186	DANGB-BG-MW32-SS1,2-3'	HG-C	8-29-88		9-28-88	
88102186	DANGB-BG-MW32-SS1,2-3'	PB-F	8-29-88		10-20-88	
88102186	DANGB-BG-MW32-SS1,2-3'	418.1	8-29-88	9-26-88	9-27-88	
88102186	DANGB-BG-MW32-SS1,2-3'	MOIS	8-29-88		9-07-88	
88102186	DANGB-BG-MW32-SS1,2-3'	8010	8-29-88		9-07-88	9-08-88
88102186	DANGB-BG-MW32-SS1,2-3'	8020	8-29-88		9-07-88	9-08-88
88102186	DANGB-BG-MW32-SS1,2-3'	8080	8-29-88	9-07-88	10-05-88	
88102186	DANGB-BG-MW32-SS1,2-3'	8270	8-29-88	9-08-88	11-30-88	

* If applicable

89-DULU0601 1

CL-FRM01

Job No.: OR001

Work Order No.: 929

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88102187DANGB-BG-MW32-SS1,11-12'	AS-F	8-29-88			10-10-88	
88102187DANGB-BG-MW32-SS1,11-12'	BA-I	8-29-88			10-20-88	
88102187DANGB-BG-MW32-SS1,11-12'	CD-F	8-29-88			10-20-88	
88102187DANGB-BG-MW32-SS1,11-12'	CR-F	8-29-88			10-20-88	
88102187DANGB-BG-MW32-SS1,11-12'	HG-C	8-29-88			9-28-88	
88102187DANGB-BG-MW32-SS1,11-12'	PB-F	8-29-88			10-20-88	
88102187DANGB-BG-MW32-SS1,11-12'	418.1	8-29-88	9-26-88		9-27-88	
88102187DANGB-BG-MW32-SS1,11-12'	MOIS	8-29-88			9-07-88	
88102187DANGB-BG-MW32-SS1,11-12'	8010	8-29-88			9-07-88	9-08-88
88102187DANGB-BG-MW32-SS1,11-12'	8020	8-29-88			9-07-88	9-08-88
88102187DANGB-BG-MW32-SS1,11-12'	8080	8-29-88	9-07-88		10-05-88	
88102187DANGB-BG-MW32-SS1,11-12'	8270	8-29-88	9-08-88		10-17-88	
88102188DANGB-BG-MW32-SS3,19-20'	AS-F	8-29-88			10-10-88	
88102188DANGB-BG-MW32-SS3,19-20'	BA-I	8-29-88			10-20-88	
88102188DANGB-BG-MW32-SS3,19-20'	CD-F	8-29-88			10-20-88	
88102188DANGB-BG-MW32-SS3,19-20'	CR-F	8-29-88			10-20-88	
88102188DANGB-BG-MW32-SS3,19-20'	HG-C	8-29-88			9-28-88	
88102188DANGB-BG-MW32-SS3,19-20'	PB-F	8-29-88			10-20-88	
88102188DANGB-BG-MW32-SS3,19-20'	418.1	8-29-88	9-26-88		9-27-88	
88102188DANGB-BG-MW32-SS3,19-20'	MOIS	8-29-88			9-07-88	
88102188DANGB-BG-MW32-SS3,19-20'	8010	8-29-88			9-07-88	9-08-88
88102188DANGB-BG-MW32-SS3,19-20'	8020	8-29-88			9-07-88	9-08-88
88102188DANGB-BG-MW32-SS3,19-20'	8080	8-29-88	9-07-88		10-05-88	
88102188DANGB-BG-MW32-SS3,19-20'	8270	8-29-88	9-08-88		10-17-88	

* If applicable

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88082186-88082188
WORK ORDER NO.: 929

These soil samples were received at the ES Berkeley Laboratory
on 8-30-88. They were received cold and intact.

ANALYSIS REPORT

WORK ORDER NUMBER: 929
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/30/88

APPROVED BY 
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 2, UNITS: mg/Kg

TEST COMPOUND	DANGB-BG, MW32, SS1, 2-3' 88082186	DANGB-BG, MW32, SS2, 11-12' 88082187	DANGB-BG, MW32, SS3, 19-20' 88082188
ACID DIG SOIL	NA	NA	NA
ARSENIC	<5.0E	<5.0E	<5.0E
BARIUM	82.6	49.2	34.9
CADMIUM	9.8N	7.6N	6.8N
CHROMIUM	46.8	23.0	22.8
MERCURY	<0.1	<0.1	<0.1
LEAD	6.3N	4.3N	2.9N

ND - Not Detected
A - Not Analyzed

ANALYSIS REPORT

WORK ORDER NUMBER: 929
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/30/88

APPROVED BY


Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 3, UNITS: mg/Kg

TEST COMPOUND	DANGB-BG, MW32, SS1, 2-3' 88082186	DANGB-BG, MW32, SS2, 11-12' 88082187	DANGB-BG, MW32, SS3, 19-20' 88082188
418.1 PETROLEUM HYDROCARBONS	<100	<100	<100
% MOISTURE	8.2	11.7	14.1

ND - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 929
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/30/88

APPROVED BY


Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/Kg, GROUP 8010

TEST COMPOUND	DANGB-BG, MW32, SS1, 2-3' 88082186	DANGB-BG, MW32, SS2, 11-12' 88082187	DANGB-BG, MW32, SS3, 19-20' 88082188
BENZYL CHLORIDE	ND	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND	ND
BIS (2-CHLOROISOPROPYL) ETHER	ND	ND	ND
BROMOBENZENE	ND	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND
BROMOFORM	ND	ND	ND
BROMOETHANE	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND
CHLORACETALDEHYDE	ND	ND	ND
CHLORAL	ND	ND	ND
CHLOROBENZENE	ND	ND	ND
CHLOROETHANE	ND	ND	ND
CHLOROFORM	ND	ND	ND
1-CHLOROHEXANE	ND	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND	ND
CHLOROMETHANE	ND	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND	ND
CHLOROTOLUENE	ND	ND	ND
DIBROMOCHLOROMETHANE	ND	ND	ND
DIBROMOMETHANE	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND
1,1-DICHLOROETHYLENE	ND	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND	ND
DICHLOROMETHANE	4.1B	4.0B	1.5B
1,2-DICHLOROPROPANE	ND	ND	ND

ND - Not Detected

11/14/88

ANALYSIS REPORT FOR WORK ORDER NUMBER 929

TEST COMPOUND	DANGB-BG, MW32, SS1, 2-3'	DANGB-BG, MW32, SS2, 11-12'	DANGB-BG, MW32, SS3, 19-20'
	88082186	88082187	88082188
1,3-DICHLOROPROPYLENE	ND	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND	ND
1,1,1,2-TETRACHLOROETHANE	ND	ND	ND
TETRACHLOROETHYLENE	ND	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND
TRICHLOROFLUOROMETHANE	ND	ND	ND
TRICHLOROPROPANE	ND	ND	ND
VINYL CHLORIDE	ND	ND	ND

ND - Not Detected

11/14/88

ANALYSIS REPORT

WORK ORDER NUMBER: 929
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/30/88

APPROVED BY


Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920


TASK: 4, UNITS: ug/Kg, GROUP 8020

TEST COMPOUND	DANGB-BG, MW32, SS1, 2-3' 88082186	DANGB-BG, MW32, SS2, 11-12' 88082187	DANGB-BG, MW32, SS3, 19-20' 88082188
BENZENE	ND	ND	ND
CHLOROBENZENE	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND
ETHYL BENZENE	ND	ND	ND
TOLUENE	28	47	31
XYLENES	ND	ND	ND

ND - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 929
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/30/88

APPROVED BY 
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/Kg, GROUP 8080

TEST COMPOUND	DANGB-BG, MW32, SS1, 2-3' 88082186	DANGB-BG, MW32, SS2, 11-12' 88082187	DANGB-BG, MW32, SS3, 19-20' 88082188
ALDRIN	ND	ND	ND
ALPHA-BHC	ND	ND	ND
BETA-BHC	ND	ND	ND
DELTA-BHC	ND	ND	ND
GAMMA-BHC	ND	ND	ND
CHLORDANE	ND	ND	ND
4,4'-DDD	ND	ND	ND
4,4'-DDE	ND	ND	ND
4,4'-DDT	ND	ND	ND
DIELDRIN	ND	ND	ND
ENDOSULFAN I	ND	ND	ND
ENDOSULFAN II	ND	ND	ND
ENDOSULFAN SULFATE	ND	ND	ND
ENDRIN	ND	ND	ND
ENDRIN ALDEHYDE	NA	NA	NA
HEPTACHLOR	ND	ND	ND
HEPTACHLOR EPOXIDE	ND	ND	ND
KEPONE	NA	NA	NA
METHOXYCHLOR	ND	ND	ND
TOXAPHENE	ND	ND	ND
PCB-1016	ND	ND	ND
PCB-1221	ND	ND	ND
PCB-1232	ND	ND	ND
PCB-1242	ND	ND	ND
PCB-1248	ND	ND	ND
PCB-1254	ND	ND	ND
PCB-1260	ND	ND	ND

ND - Not Detected

NA - Not Analyzed

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

page 1 of 5

ate Received: August 30, 1988
ate Reported: December 6, 1988

Work Order: 929
Job Number: OR001

OR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

ab Number:	88082186	88082187
ample No.:	DANGB-BG-MW32, SS1 2-3'	DANGB-BG-MW32, SS2 11-12'
ate Sampled:	08-29-88	08-29-88
ime Sampled:	14:50	15:30
ate Extracted:	09-08-88	09-08-88
ate Analyzed:	11-30-88	10-17-88
ercent Moisture:	8	12

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
,3-Dichlorobenzene	330	ND	ND
,4-Dichlorobenzene	330	ND	ND
exachloroethane	330	ND	ND
is(2-chloroethyl)ether	330	ND	ND
,2-Dichlorobenzene	330	ND	ND
-Nitrosodimethylamine	330	ND	ND
is(2-chloroisopropyl)ether	330	ND	ND
-Nitrosodi-n-propylamine	330	ND	ND
exachlorobutadiene	330	ND	ND
,2,4-Trichlorobenzene	330	ND	ND
itrobenzene	330	ND	ND
sophorone	330	ND	ND
aphthalene	330	ND	ND
is(2-chloroethoxy)methane	330	ND	ND
-Chloronaphthalene	330	ND	ND
exachlorocyclopentadiene	330	ND	ND
cenaphthylene	330	ND	ND
cenaphthene	330	ND	ND
imethyl phthalate	330	ND	ND
,6-Dinitrotoluene	330	ND	ND
luorene	330	ND	ND
,4-Dinitrotoluene	330	ND	ND
iethyl phthalate	330	ND	ND
-Nitrosodiphenylamine	330	ND	ND
exachlorobenzene	330	ND	ND

= Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

page 2 of 5

Date Received: August 30, 1988
Date Reported: December 6, 1988

Work Order: 929
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082186	88082187
Sample No.:	DANGB-BG-MW32, SS1 2-3'	DANGB-BG-MW32, SS2 11-12'
Date Sampled:	08-29-88	08-29-88
Time Sampled:	14:50	15:30
Date Extracted:	09-08-88	09-08-88
Date Analyzed:	11-30-88	10-17-88
Percent Moisture:	8	12

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Dibutyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Butyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
4-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benzidine	2000	ND	ND
3,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

B = Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Page 3 of 5

Date Received: August 30, 1988
Date Reported: December 6, 1988

Work Order: 929
Job Number: OR001

From: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082186	88082187
Sample No.:	DANGB-BG-MW32, SS1 2-3'	DANGB-BG-MW32, SS2 11-12'
Date Sampled:	08-29-88	08-29-88
Time Sampled:	14:50	15:30
Date Extracted:	09-08-88	09-08-88
Date Analyzed:	11-30-88	10-17-88
Percent Moisture:	8	12

Compound	Detection Limits ug/kg	Analytical Results (dry weight)	
		ug/kg	ug/kg
Acetophenone	--*	ND	ND
Aniline	--*	ND	ND
-Aminobiphenyl	--*	ND	ND
-Chloroaniline	660	ND	ND
-Chloronaphthalene	--*	ND	ND
Indenzofuran	330	ND	ND
-Dimethylaminoazobenzene	--*	ND	ND
,12-Dimethylbenz(a)anthracene	--*	ND	ND
-a-Dimethylphenethylamine	--*	ND	ND
iphenylamine	--*	ND	ND
,2-Diphenylhydrazine	--*	ND	ND
thyl methanesulfonate	--*	ND	ND
-Methylcholanthrene	--*	ND	ND
ethyl methanesulfonate	--*	ND	ND
-Methylnaphthalene	330	ND	ND
-Naphthylamine	--*	ND	ND
-Naphthylamine	--*	ND	ND
-Nitroaniline	1600	ND	ND
-Nitroaniline	1600	ND	ND
-Nitroaniline	1600	ND	ND
-Nitroso-di-n-butylamine	--*	ND	ND
-Nitrosopiperidine	--*	ND	ND
entachlorobenzene	--*	ND	ND
entachloronitrobenzene	--*	ND	ND
enacetin	--*	ND	ND
-Picoline	--*	ND	ND
ronamide	--*	ND	ND
,2,4,5-Tetrachlorobenzene	--*	ND	ND

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

page 4 of 5

Date Received: August 30, 1988
Date Reported: December 6, 1988

Work Order: 929
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082186	88082187
Sample No.:	DANGB-BG-MW32, SS1 2-3'	DANGB-BG-MW32, SS2 11-12'
Date Sampled:	08-29-88	08-29-88
Time Sampled:	14:50	15:30
Date Extracted:	09-08-88	09-08-88
Date Analyzed:	11-30-88	10-17-88
Percent Moisture:	8	12

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Alpha-BHC	--*	ND	ND
Gamma-BHC	--*	ND	ND
Beta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Aldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
Dieldrin	500	ND	ND
4,4'-DDE	1000	ND	ND
Endrin	--*	ND	ND
Endosulfan II	--*	ND	ND
4,4'-DDD	500	ND	ND
4,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	--*	ND	ND
Endrin Ketone	--*	ND	ND
Chlordane	2000	ND	ND
Methoxychlor	--*	ND	ND
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1248	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

page 5 of 5

Date Received: August 30, 1988
Date Reported: December 6, 1988

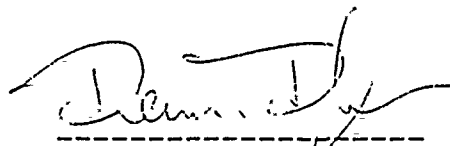
Work Order: 929
Job Number: OR001

DR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

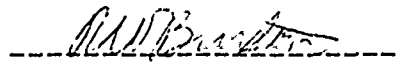
ATTN: Mr. Bill Hayden

Lab Number:	88082186	88082187
Sample No.:	DANGB-BG-MW32, SS1 2-3'	DANGB-BG-MW32, SS2 11-12'
Date Sampled:	08-29-88	08-29-88
Time Sampled:	14:50	15:30
Date Extracted:	09-08-88	09-08-88
Date Analyzed:	11-30-88	10-17-88
Percent Moisture:	8	12

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
-Chlorophenol	330	ND	ND
-Nitrophenol	330	ND	ND
phenol	330	ND	ND
,4-Dimethylphenol	330	ND	ND
,4-Dichlorophenol	330	ND	ND
,4,6-Trichlorophenol	330	ND	ND
-Chloro-3-methylphenol	660	ND	ND
,4-Dinitrophenol	1600	ND	ND
,6-Dichlorophenol	--*	ND	ND
-Methyl-4,6-Dinitrophenol	1600	ND	ND
pentachlorophenol	1600	ND	ND
-Nitrophenol	1600	ND	ND
benzoic Acid	1600	ND	ND
-Methylphenol	330	ND	ND
- & 4-Methylphenol	330	ND	ND
,3,4,6-Tetrachlorophenol	--*	ND	ND
,4,5-Trichlorophenol	330	ND	ND



Analyst



Laboratory Supervisor

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

DTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of, at client expense.

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

page 1 of 5

Date Received: August 30, 1988
Date Reported: December 6, 1988

Work Order: 929
Job Number: OR001

OR: ES:Oak Ridge/Duluth A&GB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

Lab Number: 88082188
Sample No.: DANGB-BG-MW32-SS3 19-20'
Date Sampled: 08-29-88
Time Sampled: 16:01
Date Extracted: 09-08-88
Date Analyzed: 10-17-88
Percent Moisture: 14

Compound	Detection Limit ug/kg	ANALYTICAL RESULTS
		(dry weight) ug/kg
,3-Dichlorobenzene	330	ND
,4-Dichlorobenzene	330	ND
Hexachloroethane	330	ND
Bis(2-chloroethyl)ether	330	ND
,2-Dichlorobenzene	330	ND
N-Nitrosodimethylamine	330	ND
Bis(2-chloroisopropyl)ether	330	ND
-Nitrosodi-n-propylamine	330	ND
Hexachlorobutadiene	330	ND
1,2,4-Trichlorobenzene	330	ND
Nitrobenzene	330	ND
Sophorone	330	ND
Naphthalene	330	ND
Bis(2-chloroethoxy)methane	330	ND
-Chloronaphthalene	330	ND
Hexachlorocyclopentadiene	330	ND
Acenaphthylene	330	ND
Acenaphthene	330	ND
Dimethyl phthalate	330	ND
2,6-Dinitrotoluene	330	ND
Fluorene	330	ND
,4-Dinitrotoluene	330	ND
Diethyl phthalate	330	ND
N-Nitrosodiphenylamine	330	ND
Hexachlorobenzene	330	ND

3 = Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

page 2 of 5

ate Received: August 30, 1988
ate Reported: December 6, 1988

Work Order: 929
Job Number: OR001

DR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

ab Number: 88082188
ample No.: DANGB-BG-MW32-SS3 19-20'
ate Sampled: 08-29-88
ime Sampled: 16:01
ate Extracted: 09-08-88
ate Analyzed: 10-17-88
ercent Moisture: 14

Compound	Detection Limit ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg
benanthrene	330	ND
anthracene	330	ND
ibutyl phthalate	330	ND
luoranthene	330	ND
-Chlorophenyl phenyl ether	330	ND
ylene	330	ND
utyl Benzyl phthalate	330	ND
is(2-ethylhexyl)phthalate	330	ND
arysene	330	ND
-Bromophenyl phenyl ether	330	ND
enzo(a)anthracene	330	ND
i-n-octylphthalate	330	ND
enzo(b)fluoranthene	330	ND
enzo(k)fluoranthene	330	ND
enzidine	2000	ND
,3'-Dichlorobenzidine	660	ND
enzo(a)pyrene	330	ND
adeno(1,2,3-cd)pyrene	330	ND
ibenzo(a,h)anthracene	330	ND
enzo(ghi)perylene	330	ND
enzyl Alcohol	660	ND

= Compound was detected in the blank.

Base Neutrals - SW 8270

Matrix: Soil

(continued)

Date Received: August 30, 1988
 Date Reported: December 6, 1988

Work Order: 929
 Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB
 Address: 710 S. Illinois Avenue Suite F-103
 Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

Lab Number: 88082188
 Sample No.: DANGB-BG-MW32-SS3 19-20'
 Date Sampled: 08-29-88
 Time Sampled: 16:01
 Date Extracted: 09-08-88
 Date Analyzed: 10-17-88
 Percent Moisture: 14

Compound	Detection Limits ug/kg	Analytical Results (dry weight) ug/kg
Acetophenone	---	ND
Aniline	---	ND
4-Aminobiphenyl	---	ND
2-Chloroaniline	660	ND
1-Chloronaphthalene	---	ND
Dibenzofuran	330	ND
1,2-Dimethylaminoazobenzene	---	ND
1,12-Dimethylbenz(a)anthracene	---	ND
1,1'-Dimethylphenethylamine	---	ND
Diphenylamine	---	ND
1,2-Diphenylhydrazine	---	ND
Ethyl methanesulfonate	---	ND
3-Methylcholanthrene	---	ND
Ethyl methanesulfonate	---	ND
1-Methylnaphthalene	330	ND
1-Naphthylamine	---	ND
2-Naphthylamine	---	ND
1-Nitroaniline	1600	ND
3-Nitroaniline	1600	ND
4-Nitroaniline	1600	ND
1-Nitroso-di-n-butylamine	---	ND
1-Nitrosopiperidine	---	ND
Pentachlorobenzene	---	ND
Pentachloronitrobenzene	---	ND
Phenacetin	---	ND
2-Picoline	---	ND
Pronamide	---	ND
1,2,4,5-Tetrachlorobenzene	---	ND

EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

page 4 of 5

Date Received: August 30, 1988
Date Reported: December 6, 1988

Work Order: 929
Job Number: OR001

Location: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

Lab Number: 88082188
Sample No.: DANGB-BG-MW32-SS3 '19-20'
Date Sampled: 08-29-88
Time Sampled: 16:01
Date Extracted: 09-08-88
Date Analyzed: 10-17-88
Percent Moisture: 14

Compound	Detection	ANALYTICAL RESULTS
	Limits ug/kg	(dry weight) ug/kg
alpha-BHC	--*	ND
gamma-BHC	--*	ND
delta-BHC	660	ND
gamma-chlor	330	ND
delta-BHC	500	ND
lindrin	330	ND
gamma-chlor epoxide	330	ND
endosulfan I	--*	ND
ieldrin	500	ND
,4'-DDE	1000	ND
ndrin	--*	ND
ndosulfan II	--*	ND
,4'-DDD	500	ND
,4'-DDT	830	ND
ndosulfan Sulfate	1000	ND
ndrin aldehyde	--*	ND
ndrin Ketone	--*	ND
lindane	2000	ND
gamma-chlor	--*	ND
oxaphene	2000	ND
roclor-1016	2000	ND
roclor-1221	2000	ND
roclor-1232	2000	ND
roclor-1242	2000	ND
roclor-1248	2000	ND
roclor-1254	2000	ND
roclor-1260	2000	ND

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

page 5 of 5

Date Received: August 30, 1988
Date Reported: December 6, 1988

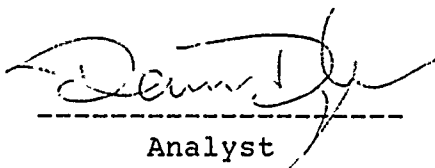
Work Order: 929
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

Lab Number: 88082188
Sample No.: DANGB-BG-MW32-SS3 19-20'
Date Sampled: 08-29-88
Time Sampled: 16:01
Date Extracted: 09-08-88
Date Analyzed: 10-17-88
Percent Moisture: 14

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS
		(dry weight) ug/kg
1-Chlorophenol	330	ND
2-Nitrophenol	330	ND
Phenol	330	ND
2,4-Dimethylphenol	330	ND
2,4-Dichlorophenol	330	ND
2,4,6-Trichlorophenol	330	ND
1-Chloro-3-methylphenol	660	ND
2,4-Dinitrophenol	1600	ND
2,6-Dichlorophenol	--*	ND
1-Methyl-4,6-Dinitrophenol	1600	ND
Pentachlorophenol	1600	ND
4-Nitrophenol	1600	ND
Benzoic Acid	1600	ND
2-Methylphenol	330	ND
3- & 4-Methylphenol	330	ND
2,3,4,6-Tetrachlorophenol	--*	ND
2,4,5-Trichlorophenol	330	ND



Analyst



Laboratory Supervisor

EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

CHAIN OF CUSTODY RECORD 929

ES JOB NO. OR001	PROJECT NAME/LOCATION Duluth ANGB/Duluth, Mn.	SHIP TO: ENGINEERING LABORATORY 600 Bancroft Way Berkeley, CA. 94710	SOILS ANALYSES REQUIRED						NO. OF CONTAINERS	REMARKS
			SW 8010, 8020	SW 8080	SW 2270	EPA 418.1	SW 8010, 7080, 7191	SW 7131, 7421, 7471		
DATE	TIME	SAMPLE DESCRIPTION	SW 8010, 8020	SW 8080	SW 2270	EPA 418.1	SW 8010, 7080, 7191	SW 7131, 7421, 7471		
8/29/88	1450	DANG-B-BG MW32, SS1 - 2-3'	X							882186
8/29/88	1450	DANG-B-BG MW32, SS1 - 2-3'		X	X	X				
8/29/88	1530	DANG-B-BG MW32, SS2 - 11-12'	X							882187
8/29/88	1530	DANG-B-BG MW32 - SS2 - 11-12'		X	X	X				
8/29/88	1601	DANG-B-BG MW32 - SS3 - 17-20'	X							882188
8/29/88	1601	DANG-B-BG MW32 - SS3 - 17-20'		X	X	X				
<div style="border: 1px solid black; padding: 5px; display: inline-block;">2514</div>										

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time
<i>[Signature]</i>	8/29/88/1801						
<i>[Signature]</i>							

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks
<i>[Signature]</i>	8/30/88	<i>[Signature]</i>	10:30	Rec'd cold & intact

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Job No.:

Client:

Attn:

Address:

Project No:

Sample Matrix: Soil

Conc. Unit: ug/kg

Work Order No: 929

Lab Sample ID: E-5886

Lab File ID: 88081909, 10, 2186-88
BLANK

Date Received: -

Date Extracted: 9-8-88

Date Analyzed: 10-17-88

Date Reported:

Dilution Factor: 1

% Moisture: -

Project: DULUTH

TICs Found: 7

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	unknown	4.74	630	
2.	unknown	5.17	18,000	
3.	unknown	6.36	300	
4.	unknown	6.91	20.0	
5.	unknown alkyl acid C ₆ H ₁₂ O ₂	24.04	630	
6.	unknown	28.77	930	
7.	unknown	33.25	270	
8.	unknown	35.75	15,000	
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				
21.				
22.				
23.				
24.				
25.				
26.				
27.				
28.				
29.				
30.				

2515

SEMI-VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

DANG B - B6 -
mw32-SS1 2-31

Lab Name: Engineering Science Contract: _____
Lab Code: _____ Case No.: 929 SAS No.: _____ SDG No.: _____
Matrix: (soil/water) Soil Lab Sample ID: 88082186 REANA
Sample wt/vol: 30 (g/mL) g Lab File ID: S 0611
Level: (low/med) low Date Received: 8/30/88
% Moisture: not dec. 8 ^{dec. 3/11/89} dec. _____ Date Extracted: 9/8/88
Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 11/30/88
GPC Cleanup: (Y/N) N pH: _____ Dilution Factor: 1

Number TICs found: 13

CONCENTRATION UNITS: ug/Kg
(ug/L or ug/Kg)

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	unknown	3.32	180	
2.	unknown	3.79	1200	
3.	unknown aliphatic	4.35	250	
4.	unknown aliphatic	4.47	180	
5.	unknown aliphatic	4.89	330	
6. <u>127-18-4</u>	<u>tetrachloroethene</u>	<u>5.09</u>	<u>620</u>	
7.	unknown	5.35	2000	
8.	unknown	5.85	17000	
9.	unknown	24.97	1600	
10.	unknown	29.74	1700	
11.	unknown	34.64	610	
12.	unknown	36.40	170	
13.	unknown	40.84	140	
14.				
15.				
16.				
17.				
18.				
19.				
20.				
21.				
22.				
23.				
24.				
25.				
26.				
27.				
28.				
29.				
30.				

Sample

Project No: DANGB-BG-MW32-SS2
Sample Matrix: Sol 11-12

Sample Matrix: So.1

Conc. Unit: $\mu\text{g}/\text{kg}$

Work Order No: 924

Lab Sample ID: E5-8829

Lab File ID: 88082187

Date Received: 8-30-88

Date Extracted: 9-8-88

Date Analyzed: 10-17-88

Date Reported:

Dilution Factor: /

% Moisture: 12

TICs Found: 7

251.7

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Job No.:

Client:

Attn:

Address:

Project: Duluth

TICs Found: 7

Sample
Project No: DANG B - BG - MW32-SS3
Sample Matrix: Soil
Conc. Unit: ug/kg
Work Order No: 929
Lab Sample ID: 65890
Lab File ID: 85082188
Date Received: 8-30-88
Date Extracted: 9-8-88
Date Analyzed: 10-17-88
Date Reported:
Dilution Factor: 1
% Moisture: 14

[illegible]

QUALITY CONTROL RESULTS SUMMARY METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: AAF-S-0034-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-29-88
Date Reported: 10-28-88
Dilution Factor: See Notes
%Moisture: 19.0

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082156-88082163, 88082186-88082188

Laboratory Supervisor Approval:

[Signature]

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	C1	Duplicate C2	RPD	SA	Spike SR	Recovery SSR	PR	Notes
Arsenic	88082156	88082156	10-10-88	9-29-88	7060	<0.5	<5.0E	<5.0E	NC	4.94	2.34E	11.8	191N	DF=10
Lead	88082156	88082156	10-20-88	9-29-88	7421	<0.5	6.4	6.3	2	6.17	6.4	20.8	233N	DF=NA

2519

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
N See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$
C1 = Concentration One
C2 = Concentration Two
NA = Not Applicable
NC = Not Calculated
ND = Not Detected

Percent Recovery (PR) = $\frac{SSR + SR}{SA} \times 100$
SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO(S): ICP-S-0034-88
QC REPORT NO(S): AAF-S-0034-88

As a result of extreme sample matrix interference, dilution was required for sample analysis. The reporting limit and MDL for the analyte(s) listed have increased as shown.

<u>Analyte</u>	<u>Reporting Limit</u>	<u>MDL</u>
Arsenic	10 mg/Kg	5.0 mg/Kg

The sample used for QC analysis contained concentrations equal to or greater than four times the spike concentration. Data are reported unflagged for the analyte(s): Lead.

Sample results for lead are reported from Furnace analysis for the following Sample No(s):

88082156, 88082161.

QUALITY CONTROL RESULTS SUMMARY METALS

OR001

Job No.:
Client:
Attn:
Address:

ES Oak Ridge
Bill Hayden
710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

ICP-S-0034-88
Soil
mg/KG
8-29-88
10-28-88
NA
19.0

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88082156-88082163, 88082186-88082188
88082192-88082199

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	C1	C2	Duplicate	RPD	SA	SR	SSR	Note
Barium	88082156	88082156	10-20-88	10-11-88	SW6010	<20	69.5	63.4	9	24.7	69.5	333	107	
Cadmium	88082156	88082156	10-20-88	10-11-88	SW6010	<0.5	7.5	7.2	4	6.2	7.5	10.6	50N	
Chromium	88082156	88082156	10-20-88	10-11-88	SW6010	<1.0	38.3	36.5	5	24.7	38.3	57.8	79	
Lead	88082156	88082156	10-22-88	10-11-88	SW6010	<10	11.6	<10	NC	61.7	11.6	65.6	88	

2521

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

See Case Narrative attached.

See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$
C1 = Concentration One
C2 = Concentration Two

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$
SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

HA = Not Applicable
NC = Not Calculated
ND = Not Detected

QC-FRM04S

QUALITY CONTROL RESULTS SUMMARY METALS

CVM-S-0013-88

QC Report No:
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 8-30-88
Date Reported: 10-10-88
Dilution Factor: NA
%Moisture: 6

Job No. OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB
Laboratory Supervisor Approval: *[Signature]*

QC Report for Laboratory Sample No(s):
88082186-88082188, 88082192-88082203
88082244-88092246, 88082248-88082249

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	C1	C2	RPD	SA	Spike Recovery		PR	Notes
											SR	SSR		
Mercury	88082186	88082186	9-22-88	9-22-88	7471	<0.1	<0.1	<0.1	NC	0.532	<0.1	0.643	121	

2522

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

C1 = Concentration One
C2 = Concentration Two

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

$$\text{Relative Percent Difference (RPD)} = \frac{C1 - C2}{(C1 + C2)/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{SSR - SR}{SA} \times 100$$

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-1C3
Oak Ridge, Tn.

QC Report No: TPH-S-0081-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-31-88
Date Prepared: 9-26-88
Date Analyzed: 9-27-88
Date Reported: 11-22-88
Dilution Factor: 8
Moisture: 7.8

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88082192-88082203, 88082186-88082188

[Signature]

Laboratory Sample No.	Anal. Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88082192	418.1	<100	<100	1100	760	69	730	66	4	*
Blank	418.1	<100	<100	1000	700	70	800	80	13	*

2523

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Percent recovery and relative percent difference are within ES Laboratory limits for matrix spike and blank spike.

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

MS = Spike Sample
MSD = Spike Duplicate

SR = Sample Result
SA = Spike Added (Concentration)

$$\text{Relative Percent Difference (RPD)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{\text{SSR} - \text{SR}}{\text{SA}} \times 100$$

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO.: VGC-S-0050-88
QC REPORT NO.: VGC-S-0050-88B

Percent recoveries are out of ES Laboratory range. A blank spike analysis shows the laboratory to be in control.

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: VGC-S-0050-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 8-31-88
Date Prepared: NA
Date Analyzed: 9-12-88
Date Reported: 10-26-88
Dilution Factor: NA
% Moisture: 12.7

Project: Duluth ANGB
Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88082186-88082188
88082192-88082202

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
88082199	Halocarbons: 8010									
	1,1-dichloroethane	11.5	ND	11.1	97	11.1	97	0	20	58-124
	Trichloroethene	11.5	ND	14.3	124*	12.9	112	10	16	75-110
	Chlorobenzene	11.5	ND	15.2	132*	15.2	132*	0	21	71-125
2525 88082199	Aromatics: 8020									
	Benzene	11.5	ND	15.2	132*	14.5	126*	5	26	75-123
	Toluene	11.5	0.99	15.2	124*	14.3	116*	6	16	79-115
	Chlorobenzene	11.5	ND	15.0	130*	14.5	126*	3	24	82-112

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* See Case Narrative attached.

$$\text{Relative Percent Difference (PR)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(\text{MS or MSD}) - \text{SR} \times 100}{\text{SA}}$$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)
NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: VGC-S-0050-88B
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: NA
Date Prepared: NA
Date Analyzed: 9-12-88
Date Reported: 10-26-88
Dilution Factor: NA
% Moisture: NA

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88082186-88082188
88082192-88082202

AWB

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
2526	Halocarbons: 8010									
	1,1-dichloroethane	10	ND	9.19	92	10.3	103	11	20	58-124
	Trichloroethene	10	ND	8.89	88	9.59	96	8	16	75-110
	Chlorobenzene	10	ND	9.24	92	9.39	94	2	21	71-125
Blank	Aromatics: 8020									
	Benzene	10	ND	8.91	89	9.37	94	5	26	75-123
	Toluene	10	ND	8.83	88	9.61	96	8	16	79-115
	Chlorobenzene	10	ND	8.78	88	9.39	94	7	24	82-112

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

$$\text{Relative Percent Difference (PR)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(\text{MS or MSD}) - \text{SR}}{\text{SA}} \times 100$$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)
NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830

Sample Matrix: Soil
 Conc. Unit: ug/Kg
 Date Reported: 10-26-88

Laboratory Supervisor Approval:

[Signature]

Project: Duluth ANGB

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
80	9-07-88	VGC	Carbopack	75-09-2 127-18-4	Dichloromethane Tetrachloroethylene	3.5 0.34	0.25 0.03	88082186-88082188

2527

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No.: OCP-S-0035-88
QC Sample No.: 88082158
Level (Low/Med): Low
Date Reported: 11-10-88

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s).:
88082156-88082163
88082186-88082188
88082250-88082254

[Signature]

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	3060	ND	113	111	46-127
Heptachlor	3060	ND	97.1	95	35-130
Aldrin	3060	ND	138	135*	34-132
Dieldrin	7640	ND	367	144*	31-134
Endrin	7640	ND	346	135	42-139
4,4'-DDT	7640	ND	398	136*	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	RPD	REC
Lindane	94.9	93	111	17	50	46-127
Heptachlor	113	110	95	15	31	35-130
Aldrin	121	118	135*	13	43	34-132
Dieldrin	344	135*	144*	6	38	31-134
Endrin	329	129	135*	5	45	42-139
4,4'-DDT	321	126	156*	21	50	23-134

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: 0 out of 6 outside limits

Spike Recovery: 5 out of 12 outside limits

2528

**PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL**

Job No: OR001
 Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830

QC Report No.: OCP-S-0035-88B
 QC Sample No.: Blank
 Level (Low/Med): Low
 Date Reported: 11-10-88

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
 88082156-88082163
 88082186-88082188
 88082250-88082254



Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2000	ND	55.5	83	46-127
Heptachlor	2000	ND	45.1	68	35-130
Aldrin	2000	ND	72.6	109	34-132
Dieldrin	5000	ND	259	156*	31-134
Endrin	5000	ND	236	142*	42-139
4,4'-DDT	5000	ND	232	139*	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits	
					RPD	REC
Lindane	68.4	103	83	21	50	46-127
Heptachlor	46.2	69	68	2	31	35-130
Aldrin	75.9	114	109	4	43	34-132
Dieldrin	302	181*	156*	15	38	31-134
Endrin	272	163*	142*	14	45	42-139
4,4'-DDT	258	155*	139*	11	50	23-134

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: 0 out of 6 outside limits

Spike Recovery: 6 out of 12 outside limits

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO.: OCP-S-0035-88
QC REPORT NO.: OCP-S-0035-88B

Analysis of matrix spikes samples resulted in high recoveries for aldrin, dieldrin, endrin and DDT. Analysis of spiked blanks showed high recoveries for the same compounds. The RPDs were good in both cases. The data related to these analyses were closely examined. No errors or problems were found.

Endrin aldehyde and Kepone were not recoverable because they were removed by the alumina column clean-up used on these samples.

PESTICIDE METHOD BLANK SUMMARY

Job No.: OR001

Lab Name: Engineering Science
Lab Sample No.: Blank

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Matrix: Soil
Level (low/med): Low
Extraction:
(SepF/Cont/Sonc): Sonc
Date Reported: 11-11-88

Project: Duluth ANGB

Date Extracted: 9-07-88
Date Analyzed (1): 10-4-88
Time Analyzed (1): 20:38
Instrument ID (1): 5890 #2
GC Column ID (1): OV-1

Date Analyzed (2):
Time Analyzed (2):
Instrument ID (2):
GC Column ID (2):

This Method Blank applies to the following samples, MS and MSD.

EPA Sample No.	Lab Sample ID (1)	Date Analyzed 1	Lab Sample ID (2)	Date Analyzed 2
-	88082156	10-04-88		
-	88082157	10-04-88		
-	88082158	10-05-88		
-	88082159	10-05-88		
-	88082160	10-05-88		
-	88082161	10-05-88		
-	88082162	10-05-88		
-	88082163	10-05-88		
-	88082186	10-05-88		
-	88082187	10-05-88		
-	88082188	10-05-88		
-	88082250	10-05-88		
-	88082251	10-05-88		
-	88082252	10-05-88		
-	88082253	10-05-88		

2531

QUALITY CONTROL RESULTS SUMMARY
EPA METHOD 8270

Job No.:	OR001	QC Report No:	BNA-S-0042-88
Client:	ES Oak Ridge	Sample Matrix:	Soil
Attn:	Bill Hayden	Conc. Unit:	ug/KG
Address:	710 S. Illinois Avenue	Date Received:	8-26-88
	Suite F-103	Date Prepared:	9-06-88
	Oak Ridge, Tn. 37830	Date Analyzed:	10-14-88
		Date Reported:	12-08-88
		Dilution Factor:	NA
		%Moisture:	17

Project: Duluth ANGB

Laboratory Supervisor Approval: *W. Burdette*

QC Report for Laboratory Sample No(s):
88082156-88082163
88082186-88082188

Fraction	Compound	SA	SR	MS	PR	MSD	PR	RPD	EPA QC Limit RPD %Recovery
B/N Laboratory Sample # 88082115	1,2,4-Trichlorobenzene	4020	ND	2460	61	2310	57	6	23 38-107
	Acenaphthene	4020	ND	2020	50	1920	48	5	19 31-137
	2,4-Dinitrotoluene	4020	ND	3410	85	2920	73	15	47 28-89
	Pyrene	4020	ND	3300	82	3450	86	4	36 35-142
	N-Nitroso-di-n-Propylamine	4020	ND	3700	92	3790	94	2	38 41-126
	1,4-Dichlorobenzene	4020	ND	1710	43	1380	34	21	27 28-104
ACID Laboratory Sample # 88082115	Pentachlorophenol	8030	ND	8750	109	8470	105	3	47 17-109
	Phenol	8030	ND	6140	76	5300	66	15	35 26-90
	2-Chlorophenol	8030	ND	4740	59	3950	49	18	50 25-102
	4-Chloro-3-Methylphenol	8030	ND	5420	67	5060	63	7	33 26-103
	4-Nitrophenol	8030	ND	2640	33	3080	38	15	50 11-114

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
The quality control sample for this batch is from a different project.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

2532

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88082186-88082188
WORK ORDER NO.: 929

These soil samples were received at the ES Berkeley Laboratory on 8-30-88. They were received cold and intact.

Sample 88082186 (DANGB-BG-MW32, SS1, 2-3') was initially analyzed within holding time. The results showed low recoveries of some of the surrogate spike. The sample extract was re-analyzed at a later date, which was out of the holding time. This analysis resulted in acceptable surrogate spike recoveries. No target compounds were found in either analysis.

METHOD BLANK SUMMARY

Job No:	OR001	Sample Matrix:	Soil
Client:	ES Oak Ridge	Conc. Unit:	ug/KG
Attn:	Bill Hayden	Date Reported:	12-12-88
Address:	710 S. Illinois Avenue Suite F-103 Oak Ridge, Tn. 37830	Laboratory Supervisor Approval:	<i>AWB</i>
Project:	Duluth ANGB		

File ID	Date Analyzed	Fraction	Instru- ment ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
E5897	10-18-88	BNA	2	-	None Detected	-	-	88082186-88082188
2534								

ENTILE CONTINUING CALIBRATION CHECK

Name: _____ Contract: _____

Code: _____ Case No.: _____ SAS No.: _____

Instrument ID: carbopak _____ Calibration Date(s): 9/7/88

LAB FILE ID: B1,82 _____ Init. Calib. Date(s): 9/2/88, 9/2/88

COMPOUND	RRF	RRFSO	%D
benzyl chloride _____	0.08		100.00
is (2-chloroethoxy) _____			
thane _____	0.04		100.00
is (2-chloroisopropyl) _____			
ther _____	0.26		100.00
monobenzene _____	1.17	1.06	9.52
modichloromethane _____	4.54	4.02	11.37
monomorph _____	3.48	3.11	10.57
monomethane _____	0.38	0.18	53.05
Carbon tetrachloride _____	4.58	4.59	-0.32
chloroacetaldehyde _____	ERR		ERR
chlorobenzene _____	1.48	1.53	-2.99
chloroethane _____	0.58	0.51	12.63
chloroform _____	4.89	4.40	10.17
-Chlorohexane _____	1.02	0.98	4.36
Chloroethyl vinyl ether _____	0.04		100.00
chloromethane _____	0.49	0.50	-0.68
chloromethyl methyl ether _____	0.17		100.00
m, & p-Chlorotoluenes _____	4.06	4.23	-4.09
bromochloromethane _____	5.29	4.07	23.07
ibromomethane _____	3.56	2.48	30.30
2_Dichlorobenzene _____	2.72	2.90	-6.58
3_Dichlorobenzene _____	2.42	2.35	2.70
4_Dichlorobenzene _____	2.36	2.50	-5.92
ichlorodifluoromethane _____	0.54		100.00
1_Dichloroethane _____	2.58	2.27	12.19
2_Dichloroethane _____	3.23	2.99	7.46
1,1_Dichloroethylene _____	2.79	2.42	12.96
ans_1,2_dichloroethylene _____	2.99	2.55	14.95
chloromethane _____	3.07	5.19	-69.14
2_Dichloropropane _____	2.67	2.51	5.85
3_Dichloropropylene _____	5.98	5.18	13.37
1,2,2_Tetrachloroethane _____	9.07	9.60	-5.53
1,1,2_Tetrachloroethane _____	4.51	4.65	-3.20
etrachloroethylene _____	9.10	9.60	-5.54
1,1-Trichloroethane _____	3.43	3.05	11.11
1,2-Trichloroethane _____	5.98	5.18	13.38
trichloroethylene _____	4.32	4.34	-0.32
trichlorofluoroethane _____	2.76	2.21	20.07
trichloropropane _____	3.33	3.13	5.94
trichloroethane _____	1.43	0.70	51.23

TILE CONTINUING CALIBRATION CHECK

Name: ENGINEERING SCIENCE _____ Contract: _____

Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID.: carbopak Calibration Date(s): 9/7/88 _____

FILE ID: RRF 50 81 _____

Init. Calib: 9/2/88

POUND	RRF	RRF50	%D
zene	5.93	5.05	-14.88
orobenzene	4.90	4.76	-2.82
_Dichlorobenzene	3.97	4.05	1.96
_Dichlorobenzene	4.57	4.48	-2.05
_Dichlorobenzene	3.83	3.57	-6.75
yl Benzene	3.32	3.19	-3.90
uene	3.79	3.86	1.77
enes	12.16	11.19	-7.97

DATA PACKAGE #43

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ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the water samples received
by this laboratory on 9-12-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88092330	DANGB-TB2	8010	9-07-88		9-14-88	9-16-88
88092330	DANGB-TB2	8020	9-07-88		9-14-88	9-16-88
88092331	DANGB-FB4	8010	9-09-88		9-15-88	9-19-88
88092331	DANGB-FB4	8020	9-09-88		9-15-88	9-19-88
88092332	DANGB-FB5	8010	9-09-88		9-15-88	9-19-88
88092332	DANGB-FB5	8020	9-09-88		9-15-88	

* If applicable

88-A1-DULU0323 1

CL-FRM01

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88092330-88092332
WORK ORDER NO.: 963

These water samples were received at the ES Berkeley Laboratory on 9-12-88. They were received cold and intact.

ANALYSIS REPORT

WORK ORDER NUMBER: 963
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/12/88

APPROVED BY 
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO. # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/L, GROUP 8010

	DANGB-TB2	DANGB-FB4	DANGB-FB5
TEST COMPOUND	88092330	88092331	88092332
BENZYL CHLORIDE	ND	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND	ND
BIS (2-CHLOROISOPROPYL) ETHER	ND	ND	ND
BROMOBENZENE	ND	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND
BROMOFORM	ND	ND	ND
BROMOETHANE	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND
CHLORACETALDEHYDE	ND	ND	ND
CHLORAL	ND	ND	ND
CHLOROBENZENE	ND	ND	ND
CHLOROETHANE	ND	ND	ND
CHLOROFORM	ND	13	14
1-CHLOROHEXANE	ND	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND	ND
CHLOROMETHANE	ND	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND	ND
CHLOROTOLUENE	ND	ND	ND
DIBROMOCHLOROMETHANE	ND	ND	ND
DIBROMOMETHANE	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	NC
DICHLORODIFLUOROMETHANE	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND
1,1-DICHLOROETHYLENE	ND	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND	ND
DICHLOROMETHANE	1.9B	2.5B	1.4B
1,2-DICHLOROPROPANE	ND	ND	ND

11/02/88

ANALYSIS REPORT FOR WORK ORDER NUMBER 963

TEST COMPOUND	DANGB-TB2 88092330	DANGB-FB4 88092331	DANGB-FB5 88092332
1,3-DICHLOROPROPYLENE	ND	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND	ND
1,1,1,2-TETRACHLOROETHANE	ND	ND	ND
TETRACHLOROETHYLENE	ND	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND
TRICHLOROFLUOROMETHANE	ND	ND	ND
TRICHLOROPROPANE	ND	ND	ND
VINYL CHLORIDE	ND	ND	ND

11/02/88

ANALYSIS REPORT

WORK ORDER NUMBER: 963
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/12/88

APPROVED BY *Bill Hayden*
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/L, GROUP 8020

	DANGB-TB2	DANGB-FB4	DANGB-FB5
TEST COMPOUND	88092330	88092331	88092332
-----	-----	-----	-----
BENZENE	ND	ND	ND
CHLOROBENZENE	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND
ETHYL BENZENE	ND	ND	ND
TOLUENE	ND	ND	ND
XYLENES	ND	ND	ND

CHAIN OF CUSTODY RECORD

960, 963 Labels 5

ES JOB NO. OR001		PROJECT NAME/LOCATION Duluth ANGB/Duluth, Mn.		NO. OF CONTAINERS	WATER ANALYSES REQUIRED								SHIP TO: ENGINEERING-SCIENCE LABORATORY, INC. 600 Bancroft Way Berkeley, CA 94710		
SAMPLES: (Signature) <i>Phedy 2. Dan</i>		SAMPLE DESCRIPTION			SW 8000, 8020	EPA 808	EPA 825	EPA 410.1	SW 6010, 7000, 7101	SW 7421, 7470	SW 9350, 9318	SW 428	REMARKS		
9-9-88	0730	DANGB-BRZ		1	X							882316			
9-7-88	0930	DANGB-TBZ		3	X							882330			
9-9-88	0930	DANGB-FB4		2	X							882331			
9-9-88	0840	DANGB-8-MWIS-GW-1		5	X							882317			
9-9-88	0930	DANGB-FBS		2	X							882330			
9-9-88	0940	DANGB-8-MW17-GW-1		5	X							882314 882312 882313			
9-9-88	1100	DANGB-8-MW16-GW-1		5	X							882315 882314			
9-9-88	1330	DANGB-4-MW25-GW-1		5	X							882312			
9-9-88	1445	DANGB-8-GW8C-GW-1		5	X							882310			
<i>Phedy 1 Dan</i>															
Relinquished by: (Signature) <i>Phedy 1 Dan</i>		Date/Time 9-9-88 1400		Received by: (Signature) Fed Ex Air Mail H 9-9-03 14243		Relinquished by: (Signature)		Date/Time		Received by: (Signature)					
Relinquished by: (Signature)		Date/Time		Received for Laboratory by: (Signature) <i>Phedy 1 Dan</i>		Date/Time		Relinquished by: (Signature)		Date/Time 9-9-12 14:00		Remarks Samples received cold and intact.			

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: ORO01

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: VGC-W-0051-88
Sample Matrix: Water
Conc. Unit: ug/L
Date Received: NA
Date Prepared: NA
Date Analyzed: 9-26-88
Date Reported: 10-27-88
Dilution Factor: NA

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88092322-88092325
88092327-88092332
88092348-88092356, 88092388

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
88092388	Halocarbons: 8010									
	1,1-Dichloroethane	10	ND	9.50	95	9.36	94	2	26	70-130
	Trichloroethene	10	ND	11.3	113	10.8	108	5	19	65-131
	Chlorobenzene	10	ND	11.4	114	11.2	112	2	40	59-137
88092388	Aromatics: 8020									
	Benzene	10	ND	11.1	111	11.3	113	2	20	56-146
	Toluene	10	ND	11.4	114	11.6	116	2	41	42-150
	Chlorobenzene	10	ND	10.5	105	11.2	112	6	36	76-133

$$\text{Relative Percent Difference (PR)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(\text{MS or MSD}) - \text{SR} \times 100}{\text{SA}}$$

MS = Spike Sample

MSD = Spike Sample Duplicate

SR = Sample Result

SA = Spike Added (Concentration)

NA = Not Applicable

NC = Not Calculated

ND = Not Detected

Job No: OR001

Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830

Sample Matrix: Water
 Conc. Unit: ug/L
 Date Reported: 10-28-88

Laboratory Supervisor Approval:

[Signature]

Project: Duluth ANGB

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
82	9-20-88	VGC	Carbopack	75-09-2 67-66-3	Dichloromethane Chloroform	1.4 0.42	0.25 0.05	88092323-88092325 88092327
35	9-15-88	VGC	Carbopack	75-09-2	Dichloromethane	1.4	0.25	88092322 88092328-88092332
50	9-16-88	VGC	Carbopack	75-09-2 67-66-3	Dichloromethane Chloroform	4.6 0.44	0.25 0.05	88092321

2546

VOLATILE CONTINUING CALIBRATION CHECK

LabName: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____

Instrument ID: vocal _____ Calibration Date(s): 9/15/88

LAB FILE ID: 3,4 _____ Init. Calib. Date(s): 9/14/88

COMPOUND	RRF	RRF50	%D
Benzyl chloride _____	4.56	4.35	4.62
bis (2-chloroethoxy) methane _____	0.12		100.00
bis (2-chloroisopropyl ether) _____	0.12		100.00
Bromobenzene _____	3.08	2.55	17.23
Bromodichloromethane _____	4.57	3.92	14.15
Bromoform _____	3.13	2.99	4.45
Bromomethane _____	0.43		100.00
Carbon tetrachloride _____	4.72	4.10	13.06
Chloroacetaldehyde _____	0.07		100.00
Chlorobenzene _____	1.33	1.20	9.77
Chloroethane _____	0.73		100.00
Chloroform _____	3.99	3.53	11.41
1-Chlorohexane _____	0.82	0.52	36.31
2-Chloroethyl vinyl ether _____	0.12		100.00
Chloromethane _____	1.84		100.00
Chloromethyl methyl ether _____	0.02		100.00
o, m, & p-Chlorotoluenes _____	3.34	2.59	22.56
Dibromochloromethane _____	4.22	4.00	5.26
Dibromomethane _____	3.06	2.46	19.64
1,2-Dichlorobenzene _____	2.04	1.82	10.70
1,3-Dichlorobenzene _____	1.75	1.56	10.64
1,4-Dichlorobenzene _____	1.70	1.53	10.03
Dichlorodifluormethane _____	0.54		100.00
1,1-Dichloroethane _____	2.70	2.14	20.90
1,2-Dichloroethane _____	3.29	2.85	13.26
1,1-Dichloroethylene _____	1.64	1.18	27.97
trans-1,2-dichloroethylene _____	2.69	2.13	20.95
Dichloromethane _____	2.98	1.84	38.14
1,2-Dichloropropane _____	3.01	2.55	15.41
1,3-Dichloropropylene _____	0.47	0.40	15.33
1,1,2,2-Tetrachloroethane _____	3.38	3.17	6.28
1,1,1,2-Tetrachloroethane _____	4.83	3.73	22.76
Tetrachloroethylene _____	4.55	3.89	14.59
1,1,1-Trichloroethane _____	2.64	2.27	14.15
1,1,2-Trichloroethane _____	4.42	3.55	19.61
Trichloroethylene _____	3.90	3.29	15.58
Trichlorofluormethane _____	0.88	0.64	27.23
Trichloropropane _____	3.08	2.55	17.23
Vinyl chloride _____	1.84		100.00

Engineering Science Laboratory - Berkeley, CA
VOLATILE CONTINUING CALIBRATION CHECK

Instrument ID.: *Vocal*

Calibration Date(s): *9/15/88*

LAB FILE ID: *3*

Init calib = 9/14/88

COMPOUND	RF	RF50	%D
Benzene_____		215.93	
	4.93	4.318681	-12.40
Chlorobenzene_____		243.13	
	4.65	4.862637	4.57
1,2_Dichlorobenzene_____		193.6813	
	4.64	3.873626	-16.52
1,3_Dichlorobenzene_____		215.1098	
	3.99	4.302197	7.82
1,4_Dichlorobenzene_____		170.6043	
	3.2	3.412087	6.63
Ethyl Benzene_____		159.0659	
	2.98	3.181318	6.76
Toluene_____		185.4395	
	3.54	3.708791	4.77
Xylenes_____		522.9281	
	9.87	10.45856	5.96

Surrogate response:

DATA PACKAGE #44

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**ENGINEERING-SCIENCE, INC.**600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the water samples received
by this laboratory on 9-13-88.Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88092348	DANGB-4-MW9-GW1	BA-I	9-11-88		10-09-88	
88092348	DANGB-4-MW9-GW1	CD-F	9-11-88		10-24-88	
88092348	DANGB-4-MW9-GW1	CR-F	9-11-88		11-02-88	
88092348	DANGB-4-MW9-GW1	PB-F	9-11-88		10-26-88	
88092348	DANGB-4-MW9-GW1	418.1	9-11-88	9-28-88	10-05-88	
88092348	DANGB-4-MW9-GW1	8010	9-11-88		9-20-88	9-16-88
88092348	DANGB-4-MW9-GW1	8020	9-11-88		9-20-88	9-16-88
88092349	DANGB-4-GW4B-GW1	BA-I	9-11-88		10-09-88	
88092349	DANGB-4-GW4B-GW1	CD-F	9-11-88		10-24-88	
88092349	DANGB-4-GW4B-GW1	CR-F	9-11-88		11-02-88	
88092349	DANGB-4-GW4B-GW1	PB-F	9-11-88		10-26-88	
88092349	DANGB-4-GW4B-GW1	418.1	9-11-88	9-28-88	10-05-88	
88092349	DANGB-4-GW4B-GW1	8010	9-11-88		9-20-88	9-16-88
88092349	DANGB-4-GW4B-GW1	8020	9-11-88		9-20-88	
88092350	DANGB-BR4	BA-I	9-11-88		10-09-88	
88092350	DANGB-BR4	CD-F	9-11-88		10-24-88	
88092350	DANGB-BR4	CR-F	9-11-88		11-02-88	
88092350	DANGB-BR4	PB-F	9-11-88		10-26-88	
88092350	DANGB-BR4	418.1	9-11-88	9-28-88	10-05-88	
88092350	DANGB-BR4	8010	9-11-88		9-15-88	9-19-88
88092350	DANGB-BR4	8020	9-11-88		9-15-88	
88092351	DANGB-TB4	8010	9-07-88		9-15-88	9-19-88
88092351	DANGB-TB4	8020	9-07-88		9-15-88	
88092352	DANGB-FB7	8010	9-11-88		9-15-88	9-19-88
88092352	DANGB-FB7	8020	9-11-88		9-15-88	
88092353	DANGB-FB8	8010	9-11-88		9-15-88	9-19-88
88092353	DANGB-FB8	8020	9-11-88		9-15-88	

* If applicable

**ENGINEERING-SCIENCE, INC.**600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the water samples received
by this laboratory on 9-13-88.Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88092348	DANGB-4-MW9-GW1	BA-I	9-11-88		10-09-88	
88092348	DANGB-4-MW9-GW1	CD-F	9-11-88		10-24-88	
88092348	DANGB-4-MW9-GW1	CR-F	9-11-88		11-02-88	
88092348	DANGB-4-MW9-GW1	PB-F	9-11-88		10-26-88	
88092348	DANGB-4-MW9-GW1	418.1	9-11-88	9-28-88	10-05-88	
88092348	DANGB-4-MW9-GW1	8010	9-11-88		9-20-88	9-16-88
88092348	DANGB-4-MW9-GW1	8020	9-11-88		9-20-88	9-16-88
88092349	DANGB-4-GW4B-GW1	BA-I	9-11-88		10-09-88	
88092349	DANGB-4-GW4B-GW1	CD-F	9-11-88		10-24-88	
88092349	DANGB-4-GW4B-GW1	CR-F	9-11-88		11-02-88	
88092349	DANGB-4-GW4B-GW1	PB-F	9-11-88		10-26-88	
88092349	DANGB-4-GW4B-GW1	418.1	9-11-88	9-28-88	10-05-88	
88092349	DANGB-4-MW4B-GW1	8010	9-11-88		9-20-88	9-16-88
88092349	DANGB-4-MW4B-GW1	8020	9-11-88		9-20-88	
88092350	DANGB-BR4	BA-I	9-11-88		10-09-88	
88092350	DANGB-BR4	CD-F	9-11-88		10-24-88	
88092350	DANGB-BR4	CR-F	9-11-88		11-02-88	
88092350	DANGB-BR4	PB-F	9-11-88		10-26-88	
88092350	DANGB-BR4	418.1	9-11-88	9-28-88	10-05-88	
88092350	DANGB-BR4	8010	9-11-88		9-15-88	9-19-88
88092350	DANGB-BR4	8020	9-11-88		9-15-88	
88092351	DANGB-TB4	8010	9-07-88		9-15-88	9-19-88
88092351	DANGB-TB4	8020	9-07-88		9-15-88	
88092352	DANGB-FB7	8010	9-11-88		9-15-88	9-19-88
88092352	DANGB-FB7	8020	9-11-88		9-15-88	
88092353	DANGB-FB8	8010	9-11-88		9-15-88	9-19-88
88092353	DANGB-FB8	8020	9-11-88		9-15-88	

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88092348-88092353
WORK ORDER NO.: 969

These water samples were received at the ES Berkeley Laboratory
on 9-13-88. They were received cold and intact.

ANALYSIS REPORT

WORK ORDER NUMBER: 969
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/13/88

APPROVED BY *J. Met...*
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 2, UNITS: mg/L

TEST COMPOUND	DANGB-4-MW9- GW-1 88092348	DANGB-4-GW4B- GW-1 88092349	DANGB-BR4 88092350
ACID DIG FLAME	NA	NA	NA
ACID DIG FURNACE	NA	NA	NA
BARIUM	0.09B	<0.05	<0.05
CADMIUM	0.0025 BW	0.0031 B	<0.001
CHROMIUM	<0.002	0.0022 B	<0.002
LEAD	<0.005	<0.005	<0.005

NA - Not Analyzed

ND - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 969
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/13/88

APPROVED BY *W. B. Burton*
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 3, UNITS: mg/L

TEST COMPOUND	DANGB-4-MW9- GW-1 88092348	DANGB-4-GW4B- GW-1 88092349	DANGB-BR4 88092350
418.1 PETROLEUM HYDROCARBONS	<1.5	<1.5	<1.5

ND - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 969
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/13/88

APPROVED BY

M. B. Burton
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

: OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

SK: 4, UNITS: ug/L, GROUP 8010

	DANGB-4-MW9- GW-1	DANGB-4-GW4B- GW-1	DANGB-BR4	DANGB-TB4	DANGB-FB7	DANGB-FB8
TEST COMPOUND	88092348	88092349	88092350	88092351	88092352	88092353
.....
NYL CHLORIDE	ND	ND	ND	ND	ND	ND
S (2-CHLOROETHOXY)METHANE	ND	ND	ND	ND	ND	ND
S (2-CHLOROISOPROPYL)ETHER	ND	ND	ND	ND	ND	ND
OMOBENZENE	ND	ND	ND	ND	ND	ND
OMODICHLOROMETHANE	ND	ND	ND	ND	ND	ND
OMOFORM	ND	ND	ND	ND	ND	ND
OMOETHANE	ND	ND	ND	ND	ND	ND
ARBON TETRACHLORIDE	ND	ND	ND	ND	ND	ND
ORACETALDEHYDE	ND	ND	ND	ND	ND	ND
ORAL	ND	ND	ND	ND	ND	ND
OROBENZENE	ND	ND	ND	ND	ND	ND
OROETHANE	ND	ND	ND	ND	ND	ND
OROFORM	ND	ND	15	ND	15	15
CHLOROHEXANE	ND	ND	ND	ND	ND	ND
CHLOROETHYL VINYL ETHER	ND	ND	ND	ND	ND	ND
LOROMETHANE	ND	ND	ND	ND	ND	ND
LOROMETHYL METHYL ETHER	ND	ND	ND	ND	ND	ND
LOROTOLUENE	ND	ND	ND	ND	ND	ND
BROMOCHLOROMETHANE	ND	ND	ND	ND	ND	ND
BROMOMETHANE	ND	ND	ND	ND	ND	ND
2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
CHLORODIFLUOROMETHANE	ND	ND	ND	ND	ND	ND
1-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
2-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
1-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
ANS-1,2-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
CHLOROMETHANE	0.378	0.508	1.68	2.08	1.68	2.18
2-DICHLOROPROPANE	ND	ND	ND	ND	ND	ND

- Not Detected

PAGE 4

DANGB-4-MW9-GW-1	DANGB-4-GW4B-GW-1	DANGB-BR4	DANGB-TB4	DANGB-FB7	DANGB-FB8
88092348	88092349	88092350	88092351	88092352	88092353

1,3-DICHLOROPROPYLENE	ND	ND	ND	ND	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
TETRACHLOROETHYLENE	ND	ND	ND	ND	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
TRICHLOROFLUOROMETHANE	ND	ND	ND	ND	ND	ND
TRICHLOROPROPANE	ND	ND	ND	ND	ND	ND
VINYL CHLORIDE	ND	ND	ND	ND	ND	ND

2557

ENGINEERING-SCIENCE INC.

11/03/88

PAGE 5

ANALYSIS REPORT

WORK ORDER NUMBER: 969
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/13/88

APPROVED BY

Lab Supervisor

REPORT DATA:

ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:

ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

: OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

SK: 4, UNITS: ug/L, GROUP 8020

	DANGB-4-MW9- GW-1	DANGB-4-GW4B- GW-1	DANGB-BR4	DANGB-TB4	DANGB-FB7	DANGB-153
TEST COMPOUND	88092348	88092349	88092350	88092351	88092352	88092353
BENZENE	3.2	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
ETHYL BENZENE	ND	ND	ND	ND	ND	ND
TOLUENE	ND	ND	ND	ND	ND	ND
XYLENES	2.7	ND	ND	ND	ND	ND

- Not Detected

2558

ANALYSIS REPORT

WORK ORDER NUMBER: 969
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/13/88

APPROVED BY *[Signature]*
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 3, UNITS: mg/L

TEST COMPOUND	DANGB-4-MW9- GW-1 88092348	DANGB-4-GW4B- GW-1 88092349	DANGB-BR4 88092350
418.1 PETROLEUM HYDROCARBONS	<1.5	<1.5	<1.5

ND - Not Detected

CHAIN OF CUSTODY RECORD

ES JOB NO.	PROJECT NAME/LOCATION	NO. OF CONTAINERS	WATER ANALYSES REQUIRED	SHIP TO:
OR001	Duluth ANGB/Duluth, Min.			ENGINEERING-SCIENCE LABORATORY, INC. 600 Bancroft Way Berkeley, CA 94710
SAMPLE(S): (Signature)				
DATE	TIME	SAMPLE DESCRIPTION		REMARKS
9-11-58	0900	DANOB-124	SW 800, 8020	
9-11-58	0930	DANOB-TB4	EPA 608	
9-11-58	1000	DANOB-EB7	EPA 625	
9-11-58	1030	DANOB-4-GW-1	EPA 410.1	
9-11-58	1100	DANOB-4-GW-1	SW 742, 7470	
9-11-58	1530	DANOB-F.8	SW 930, 9315	
9-11-58	1545	DANOB-4-GW-1	SW 420	
9-11-58	1730	DANOB-4-GW-1		
<div style="border: 1px solid black; padding: 5px; display: inline-block;"> 1 DU 1 DU </div>				
Relinquished by: (Signature)			Relinquished by: (Signature)	Received by: (Signature)
Date/Time			Date/Time	Date/Time
9-11-58 0900				
Relinquished by: (Signature)			Relinquished by: (Signature)	Received by: (Signature)
Date/Time			Date/Time	Date/Time
9-11-58 1400				

Distribution: Original: Accompanies Shipment, Copy to Coordinator Field Files

CHAIN OF CUSTODY RECORD

ES JOB NO. OR001		PROJECT NAME/LOCATION Duluth ANGB/Duluth, Mn.		NO. OF CON- TAINERS	WATER ANALYSES REQUIRED										SHIP TO: ENGINEERING-SCIENCE LABORATORY, INC. 600 Bancroft Way Berkeley, CA 94710	
SAMPLE(S): (Signature)		SAMPLE DESCRIPTION			EPA 808, 8020	EPA 608	EPA 625	EPA 470.1	SW 608, 7000-7101	SW 7421, 7478	SW 9370, 9318	SW 4220	REMARKS			
1-6	1000	DANGLS-4-GW-1		2				X								
1-6	1000	DANGLS-4-MW-52-GW-1		2				X								
1-6	1545	DANGLS-4-MW-1-GW-1		4				X								
1-6	1130	DANGLS-4-GWAB-GW-1		4				X								
<div style="border: 1px solid black; padding: 10px; width: fit-content; margin: 0 auto;"> <p>4.00</p> <p>1.00</p> <p>1.00</p> </div>																
Retinquished by: (Signature)					Retinquished by: (Signature)					Received by: (Signature)						
Date/Time					Date/Time					Date/Time						
1-6 0100					1-6 0100					1-6 0100						
Retinquished by: (Signature)					Retinquished by: (Signature)					Received by: (Signature)						
Date/Time					Date/Time					Date/Time						
1-6 0100					1-6 0100					1-6 0100						

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETER:
PETROLEUM HYDROCARBONS

Job No.: OR001 QC Report No: TPH-W-0070-88
Client: ES Oak Ridge Sample Matrix: Water
Attn: Bill Hayden Conc. Unit: mg/L
Address: 710 S. Illinois Avenue Date Received: 9-28-88
Suite F-103 Date Prepared: 10-05-88
Oak Ridge, Tn. 37830 Date Analyzed: 11-01-88
Dilution Factor: NA

Project: Duluth ANGB Laboratory Supervisor Approval: *[Signature]*

QC Report for Laboratory Sample No(s):
88092422, 88092424-88092427, 88092433
88092509-88092511, 88092513, 88092515-88092516
88092346, 88092348-88092349, 88092350, 88C32494-88092495

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88092516	418.1	<1.5	<1.5	39.5	29.6	75	30.4	77	3	*
2563										

* Reporting limit for the samples in this batch is provided by the sub-contract laboratory.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$ MS = Spike Sample NA = Not Applicable
MSD = Spike Duplicate NC = Not Calculated
Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$ SR = Sample Result ND = Not Detected
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: VGC-W-0051-88
Sample Matrix: Water
Conc. Unit: ug/L
Date Received: NA
Date Prepared: NA
Date Analyzed: 9-26-88
Date Reported: 10-27-88
Dilution Factor: NA

Project: Duluth ANGB
Laboratory Supervisor Approval:
[Signature]

QC Report for Laboratory Sample No(s):
88092322-88092325
88092327-88092332
88092348-88092356, 88092388

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
88092388	Halocarbons: 8010									
	1,1-Dichloroethane	10	ND	9.50	95	9.36	94	2	26	70-130
	Trichloroethene	10	ND	11.3	113	10.8	108	5	19	65-131
	Chlorobenzene	10	ND	11.4	114	11.2	112	2	40	59-137
2564 88092388	Aromatics: 8020									
	Benzene	10	ND	11.1	111	11.3	113	2	20	56-146
	Toluene	10	ND	11.4	114	11.6	116	2	41	42-150
	Chlorobenzene	10	ND	10.5	105	11.2	112	6	36	76-133

$$\text{Relative Percent Difference (PR)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(\text{MS or MSD}) - \text{SR} \times 100}{\text{SA}}$$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830

Sample Matrix: Water
 Conc. Unit: ug/L
 Date Reported: 10-31-88

Laboratory Supervisor Approval:

[Signature]

Project: Duluth ANGB

File ID	Date Analyzed	Fraction	Instru- ment ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
82	9-20-88	VGC	Carbopack	75-09-2 67-66-3	Dichloromethane Chloroform	1.4 0.42	0.25 0.05	88092348-88092349 88092354-88092356
35	9-15-88	VGC	Carbopack	75-09-2	Dichloromethane	1.4	0.25	88092350-88092353

2565

QUALITY CONTROL RESULTS SUMMARY METALS

Job No.: OR001
 Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830

QC Report No: ICP-W-0050-88
 Sample Matrix: Water
 Conc. Unit: ug/L
 Date Received: 9-13-88
 Date Reported: 11-07-88
 Dilution Factor: NA

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
 88092348-88092350, 88092354-88092355
 88092388-88092390, 88092422-88092427, 88082189

Laboratory Supervisor Approval:
[Signature]

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	C1	Duplicate C2	RPD	SA	Spike Recovery SR	SSR	PR	Notes
Barium	88092348	88092348	10-20-88	10-18-88	6010	<0.2	0.089	0.064	NC	2.00	0.089	2.47	119	A
Cadmium	88092348	88092348	10-20-88	10-18-88	6010	<0.005	<0.001	<0.001	NC	0.050	<0.001	0.038	76	

2566

A - See Case Narrative attached.

$$\text{Relative Percent Difference (RPD)} = \frac{C1 - C2}{(C1 + C2)/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{\text{SSR} - \text{SR} \times 100}{\text{SA}}$$

C1 = Concentration One
 C2 = Concentration Two
 NA = Not Applicable
 NC = Not Calculated
 ND = Not Detected

SSR = Spiked Sample Result
 SR = Sample Result
 SA = Spike Added (Concentration)

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO.: ICP-W-0050-88

The Relative Percent Difference is not calculated for Barium since the sample values are less than five times the reporting limit. Acceptable RPD in this case is defined as duplicate values within one detection limit of each other.

QUALITY CONTROL RESULTS SUMMARY METALS

Job No.: OR001
 Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite R-103
 Oak Ridge, Tn. 37830

QC Report No: AAF-W-0031-88
 Sample Matrix: Water
 Conc. Unit: ug/L
 Date Received: 8-31-88
 Date Reported: 11-07-88
 Dilution Factor: NA

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
 88092348-88092350, 88092354-88092355, 88092317
 88092388-88092390, 88092422-88092427, 88092189

Laboratory Supervisor Approval:
[Signature]

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	C1	C2	Duplicate RPD	SA	Spike Recovery SR	SSR	PR	Notes
Arsenic	88082189	88082189	10-26-88	10-18-88	7060	<0.010	<0.005	<0.005	NC	0.040	<0.005	0.0517	129N	
Chromium	88082189	88082189	10-26-88	10-18-88	6010	<0.005	<0.002	<0.002	NC	20.0	<0.002	21.6	108	
Lead	88082189	88082189	10-25-88	10-18-88	7421	<0.010	<0.005	<0.005	NC	0.020	<0.005	0.0227	114	

2568

N - See Legend attached.

$$\text{Relative Percent Difference (RPD)} = \frac{C1 - C2}{(C1 + C2)/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{\text{SSR} - \text{SR} \times 100}{\text{SA}}$$

C1 = Concentration One
 C2 = Concentration Two
 SSR = Spiked Sample Result
 SR = Sample Result
 SA = Spike Added (Concentration)

NA = Not Applicable
 NC = Not Calculated
 ND = Not Detected

DATA PACKAGE #45

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ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the soil samples received
by this laboratory on 8-22-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88082043	DANGB-4-MW22-SS1	BA-I	8-20-88		9-19-88	
88082043	DANGB-4-MW22-SS1	CD-F	8-20-88		9-19-88	
88082043	DANGB-4-MW22-SS1	CR-F	8-20-88		9-19-88	
88082043	DANGB-4-MW22-SS1	PB-F	8-20-88		10-04-88/10-05-88	
88082043	DANGB-4-MW22-SS1	418.1	8-20-88	9-15-88	9-15-88	
88082043	DANGB-4-MW22-SS1	MOIS	8-20-88		8-31-88	
88082043	DANGB-4-MW22-SS1	8010	8-20-88		8-31-88	9-02-88
88082043	DANGB-4-MW22-SS1	8020	8-20-88		8-31-88	8-31-88
88082043	DANGB-4-MW22-SS1	8080	8-20-88	8-31-88	10-03-88	
88082044	DANGB-4-MW22-SS2	BA-I	8-20-88		9-19-88	
88082044	DANGB-4-MW22-SS2	CD-F	8-20-88		9-19-88	
88082044	DANGB-4-MW22-SS2	CR-F	8-20-88		9-19-88	
88082044	DANGB-4-MW22-SS2	PB-F	8-20-88		10-04-88/10-05-88	
88082044	DANGB-4-MW22-SS2	418.1	8-20-88	9-15-88	9-15-88	
88082044	DANGB-4-MW22-SS2	MOIS	8-20-88		8-31-88	
88082044	DANGB-4-MW22-SS2	8010	8-20-88		8-31-88	9-02-88
88082044	DANGB-4-MW22-SS2	8020	8-20-88		8-31-88	8-31-88
88082044	DANGB-4-MW22-SS2	8080	8-20-88	8-30-88	10-03-88	

* If applicable

88-A1-DULU0728 1

A SUBSIDIARY OF THE PARSONS CORPORATION

2571

CL-FRM01



ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

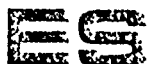
Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88082045	DANGB-4-MW22-SS3	BA-I	8-20-88		9-19-88	
88082045	DANGB-4-MW22-SS3	CD-F	8-20-88		9-19-88	
88082045	DANGB-4-MW22-SS3	CR-F	8-20-88		9-19-88	
88082045	DANGB-4-MW22-SS3	PB-F	8-20-88		10-04-88/10-05-88	
88082045	DANGB-4-MW22-SS3	418.1	8-20-88	9-15-88	9-15-88	
88082045	DANGB-4-MW22-SS3	MOIS	8-20-88		8-31-88	
88082045	DANGB-4-MW22-SS3	8010	8-20-88		9-01-88	9-02-88
88082045	DANGB-4-MW22-SS3	8020	8-20-88		9-01-88	9-01-88
88082045	DANGB-4-MW22-SS3	9080	8-20-88	8-30-88	10-03-88	
88082046	DANGB-4-MW21-SS1	BA-I	8-20-88		9-19-88	
88082046	DANGB-4-MW21-SS1	CD-F	8-20-88		9-19-88	
88082046	DANGB-4-MW21-SS1	CR-F	8-20-88		9-19-88	
88082046	DANGB-4-MW21-SS1	PB-F	8-20-88		10-04-88/10-05-88	
88082046	DANGB-4-MW21-SS1	418.1	8-20-88	9-15-88	9-15-88	
88082046	DANGB-4-MW21-SS1	MOIS	8-20-88		9-02-88	
88082046	DANGB-4-MW21-SS1	8010	8-20-88		9-01-88	9-02-88
88082046	DANGB-4-MW21-SS1	8020	8-20-88		9-01-88	9-01-88
88082046	DANGB-4-MW21-SS1	8080	8-20-88	8-30-88	10-03-88	10-03-88
88082047	DANGB-4-MW21-SS2	BA-I	8-20-88		9-19-88	
88082047	DANGB-4-MW21-SS2	CD-F	8-20-88		9-19-88	
88082047	DANGB-4-MW21-SS2	CR-F	8-20-88		9-19-88	
88082047	DANGB-4-MW21-SS2	PB-F	8-20-88		10-04-88/10-05-88	
88082047	DANGB-4-MW21-SS2	418.1	8-20-88	9-15-88	9-15-88	
88082047	DANGB-4-MW21-SS2	MOIS	8-20-88		8-31-88	
88082047	DANGB-4-MW21-SS2	8010	8-20-88		9-01-88	9-02-88
88082047	DANGB-4-MW21-SS2	8020	8-20-88		9-01-88	9-01-88
88082047	DANGB-4-MW21-SS2	8080	8-20-88	8-31-88	10-03-88	

* If applicable

**ENGINEERING-SCIENCE, INC.**600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88082048	DANGB-4-MW21-SS3	BA-I	8-20-88		9-19-88	
88082048	DANGB-4-MW21-SS3	CD-F	8-20-88		9-19-88	
88082048	DANGB-4-MW21-SS3	CR-F	8-20-88		9-19-88	
88082048	DANGB-4-MW21-SS3	PB-F	8-20-88		10-04-88/10-05-88	
88082048	DANGB-4-MW21-SS3	418.1	8-20-88	9-15-88	9-15-88	
88082048	DANGB-4-MW21-SS3	MOIS	8-20-88		8-31-88	
88082048	DANGB-4-MW21-SS3	8010	8-20-88		9-01-88	9-02-88
88082048	DANGB-4-MW21-SS3	8020	8-20-88		9-01-88	9-01-88
88082048	DANGB-4-MW21-SS3	8080	8-20-88	8-30-88	10-03-88	
88082049	DANGB-4-MP21-SS2	BA-I	8-20-88		9-19-88	
88082049	DANGB-4-MP21-SS2	CD-F	8-20-88		9-19-88	
88082049	DANGB-4-MP21-SS2	CR-F	8-20-88		9-19-88	
88082049	DANGB-4-MP21-SS2	PB-F	8-20-88		10-04-88/10-05-88	
88082049	DANGB-4-MP21-SS2	418.1	8-20-88	9-15-88	9-15-88	
88082049	DANGB-4-MP21-SS2	MOIS	8-20-88		8-31-88	
88082049	DANGB-4-MP21-SS2	8010	8-20-88		9-01-88	9-02-88
88082049	DANGB-4-MP21-SS2	8020	8-20-88		9-01-88	9-01-88
88082049	DANGB-4-MP21-SS2	8080	8-20-88	8-30-88	10-03-88	

* If applicable

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88082043-88082049
WORK ORDER NO.: 894

These soil samples were received at the ES Berkeley Laboratory on 8-22-88. They were received cold and intact.

Due to a suspected interelement matrix interference, all cadmium data at levels reportable by ICP analysis (>1 mg/KG dry wt.) are potentially false positives. This is being investigated and follow-up will be provided when available.

ANALYSIS REPORT

WORK ORDER NUMBER: 894
JOB NUMBER : Z8000000440
WORK ORDER DATE : 08/22/88

APPROVED BY

[Signature]
Lab Supervisor

REPORT DATA:
S OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

ASK: 2, UNITS: mg/Kg

	DANGB4-MW22-SS1 8-19-88 88082043	DANGB-4-MW22- SS2 88082044	DANGB-4-MW22- SS3 88082045	DANGB-4-MW21- SS1 88082046	DANGB-4-MW21- SS2 88082047	DANGB-4-MW21- SS3 88082048
TEST COMPOUND						
ACID DIG SOIL	NA	NA	NA	NA	NA	NA
ARIUM	91.7*	85.6*	39.1*	58.3 *	67.8*	49.1*
CADMIUM	0.32B	11.0*N E	9.7*N E	10.8*N E	10.9*N E	10.7*N E
CHROMIUM	11.0	36.8	26.7	30.1	33.1	39.4
LEAD	6.5S*	5.9*	2.9*	5.4*	7.3*S	3.2*

NA- NOT APPLICABLE
ND - Not Detected

12/27/88

ANALYSIS REPORT FOR WORK ORDER NUMBER 894

SK: 2, UNITS: mg/Kg

	DANGB-4-MP21-
	SS2
ST COMPOUND	88082049

ID DIG SOIL	NA
RIUM	61.0*
OMIUM	10.4*NE
ROMIUM	34.3
AD	3.8*

- NOT APPLICABLE
- Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 894
JOB NUMBER : Z80000000440
WORK ORDER DATE : 08/22/88

APPROVED BY *Bill Hayden*
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 3, UNITS: mg/Kg

	DANGB4-MW22-SS1 8-19-88 88082043	DANGB-4-MW22- SS2 88082044	DANGB-4-MW22- SS3 88082045	DANGB-4-MW21- SS1 88082046	DANGB-4-MW21- SS2 88082047	DANGB-4-MW21- SS3 88082048
TEST COMPOUND						
418.1 PETROLEUM HYDROCARBONS	530	<100	<100	<100	<100	<100
% MOISTURE	73.6	21.8	10.5	11.7	19.3	7.2

ND - Not Detected

12/14/88

ANALYSIS REPORT FOR WORK ORDER NUMBER 894

SK: 3, UNITS: mg/Kg

	DANGB-4-MP21-
	SS2
TEST COMPOUND	88082049

8.1 PETROLEUM HYDROCARBONS	<100
MOISTURE	19.2

- Not Detected

12/14/88

ANALYSIS REPORT

WORK ORDER NUMBER: 894
 JOB NUMBER : ZB0000000440
 WORK ORDER DATE : 08/22/88

APPROVED BY

Lab Supervisor

REPORT DATA:

ES OAK RIDGE/DULUTH ANGB
 710 S. ILLINOIS AVE. STE. S103
 OAK RIDGE, TN 37830
 BILL HAYDEN

CLIENT DATA:

ES OAK RIDGE/DULUTH ANGB (134)
 710 S. ILLINOIS AVE. STE. S103
 OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
 CONTACT : BILL HAYDEN
 (615)-481-3920

ASK: 4, UNITS: ug/KG, GROUP 8010

EST COMPOUND	DANGB4-MW22-SS1 8-19-88 88082043	DANGB-4-MW22- SS2 88082044	DANGB-4-MW22- SS3 88082045	DANGB-4-MW21- SS1 88082046	DANGB-4-MW21- SS2 88082047	DANGB-4-MW21- SS3 88082048
BENZYL CHLORIDE	ND	ND	ND	ND	ND	ND
IS (2-CHLOROETHOXY)METHANE	ND	ND	ND	ND	ND	ND
IS (2-CHLOROISOPROPYL)ETHER	ND	ND	ND	ND	ND	ND
BROMOBENZENE	ND	ND	ND	ND	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND	ND	ND	ND
BROMOFORM	ND	ND	ND	ND	ND	ND
BROMOETHANE	ND	ND	ND	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND	ND	ND	ND
CHLORACETALDEHYDE	ND	ND	ND	ND	ND	ND
CHLORAL	ND	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND
CHLOROETHANE	ND	ND	ND	ND	ND	ND
CHLOROFORM	ND	1.1	0.56	ND	ND	ND
1-CHLOROHEXANE	ND	ND	ND	ND	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND	ND	ND	ND	ND
CHLOROMETHANE	ND	ND	ND	ND	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND	ND	ND	ND	ND
CHLOROTOLUENE	ND	ND	ND	ND	ND	ND
DIBROMOCHLOROMETHANE	ND	ND	ND	ND	ND	ND
DIBROMOMETHANE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
DICHLOROMETHANE	17B	4.6B	6.0B	6.7B	3.5B	2.8B
1,2-DICHLOROPROPANE	ND	ND	ND	ND	ND	ND

ND - Not Detected

2579

ANALYSIS REPORT FOR WORK ORDER NUMBER 894

TEST COMPOUND	DANGB4-MW22-SS1 8-19-88 88082043	DANGB-4-MW22- SS2 88082044	DANGB-4-MW22- SS3 88082045	DANGB-4-MW21- SS1 88082046	DANGB-4-MW21- SS2 88082047	DANGB-4-MW21- SS3 88082048
1,3-DICHLOROPROPYLENE	ND	ND	ND	ND	ND	ND
1,2,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
1,2,2-TETRACHLOROETHYLENE	ND	ND	ND	ND	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
1,1-DICHLOROFLUOROMETHANE	ND	ND	ND	ND	ND	ND
1,1-DICHLOROPROPANE	ND	ND	ND	ND	ND	ND
1,1-DICHLORIDE	ND	ND	ND	ND	ND	ND

- Not Detected

12/14/88

ANALYSIS REPORT

WORK ORDER NUMBER: 894
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/22/88

APPROVED BY

Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/KG, GROUP 8020

TEST COMPOUND	DANGB4-MW22-SS1 8-19-88 88082043	DANGB-4-MW22- SS2 88082044	DANGB-4-MW22- SS3 88082045	DANGB-4-MW21- SS1 88082046	DANGB-4-MW21- SS2 88082047	DANGB-4-MW21- SS3 88082048
BENZENE	ND	ND	ND	ND	11	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	NC	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
ETHYL BENZENE	ND	ND	ND	ND	ND	ND
TOLUENE	120	100	830	330	120	53
XYLENES	ND	ND	ND	ND	ND	ND

ND - Not Detected

12/14/88

ANALYSIS REPORT FOR WORK ORDER NUMBER 894

.SK: 4, UNITS: ug/KG, GROUP 8010

	DANGB-4-MP21-
	SS2
.ST COMPOUND	88082049
-----	-----
ANZYL CHLORIDE	ND
S (2-CHLOROETHOXY)METHANE	ND
S (2-CHLOROISOPROPYL)ETHER	ND
OMOBENZENE	ND
OMODICHLOROMETHANE	ND
OMOFORM	ND
OMOETHANE	ND
ARBON TETRACHLORIDE	ND
FLORACETALDEHYDE	ND
FLORAL	ND
FLOROBENZENE	ND
FLOROETHANE	ND
FLOROFORM	ND
CHLOROHEXANE	ND
-CHLOROETHYL VINYL ETHER	ND
FLOROMETHANE	ND
FLOROMETHYL METHYL ETHER	ND
FLOROTOLUENE	ND
BROMOCHLOROMETHANE	ND
BROMOMETHANE	ND
2-DICHLOROBENZENE	ND
3-DICHLOROBENZENE	ND
4-DICHLOROBENZENE	ND
CHLORODIFLUOROMETHANE	ND
1-DICHLOROETHANE	ND
2-DICHLOROETHANE	ND
1-DICHLOROETHYLENE	ND
ANS-1,2-DICHLOROETHYLENE	ND
CHLOROMETHANE	2.78
2-DICHLOROPROPANE	ND
3-DICHLOROPROPYLENE	ND
1,2,2-TETRACHLOROETHANE	ND
1,1,2-TETRACHLOROETHANE	ND
TRACHLOROETHYLENE	ND
1,1-TRICHLOROETHANE	ND
1,2-TRICHLOROETHANE	ND
ICHLOROETHYLENE	ND
ICHLOROFLUOROMETHANE	ND
ICHLOROPROPANE	ND
NYL CHLORIDE	ND

- Not Detected

12/14/88

ANALYSIS REPORT FOR WORK ORDER NUMBER 894

TASK: 4, UNITS: ug/KG, GROUP 8020

DANGB-4-MP21-

SS2

TEST COMPOUND

88082049

BENZENE	10
CHLOROBENZENE	ND
1,2-DICHLOROBENZENE	ND
1,3-DICHLOROBENZENE	ND
1,4-DICHLOROBENZENE	ND
ETHYL BENZENE	ND
TOLUENE	32
XYLENES	4.1

ND - Not Detected

12/14/88

ANALYSIS REPORT

WORK ORDER NUMBER: 894
 JOB NUMBER : ZB0000000440
 WORK ORDER DATE : 08/22/88

APPROVED BY



Lab Supervisor

PORT DATA:
 OAK RIDGE/DULUTH ANGB
 0 S. ILLINOIS AVE. STE. S103
 OAK RIDGE, TN 37830
 BILL HAYDEN

CLIENT DATA:
 ES OAK RIDGE/DULUTH ANGB (134)
 710 S. ILLINOIS AVE. STE. S103
 OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
 CONTACT : BILL HAYDEN
 (615)-481-3920

SK: 4, UNITS: ug/Kg, GROUP 8080

TEST COMPOUND	DANGB4-MW22-SS1 8-19-88 88082043	DANGB-4-MW22- SS2 88082044	DANGB-4-MW22- SS3 88082045	DANGB-4-MW21- SS1 88082046	DANGB-4-MW21- SS2 88082047	DANGB-4-MW21- SS3 88082048
DRIN	ND	ND	ND	ND	ND	ND
CPHA-BHC	ND	ND	ND	ND	ND	ND
TA-BHC	ND	ND	ND	ND	ND	ND
DLTA-BHC	ND	ND	ND	ND	ND	ND
DMMA-BHC	ND	ND	ND	ND	ND	ND
HLORDANE	ND	ND	ND	ND	ND	ND
4'-DDD	ND	ND	ND	ND	ND	ND
4'-DDE	ND	ND	ND	ND	ND	ND
4'-DDT	ND	ND	ND	19	ND	ND
ELDRIN	ND	ND	ND	ND	ND	ND
DOSULFAN I	ND	ND	ND	ND	ND	ND
DOSULFAN II	ND	ND	ND	ND	ND	ND
DOSULFAN SULFATE	ND	ND	ND	ND	ND	ND
DRIN	ND	ND	ND	ND	ND	ND
DRIN ALDEHYDE	NA	NA	NA	NA	NA	NA
PTACHLOR	ND	ND	ND	ND	ND	ND
PTACHLOR EPOXIDE	ND	ND	ND	ND	ND	ND
PONE	NA	NA	NA	NA	NA	NA
THOXYCHLOR	ND	ND	ND	ND	ND	ND
OXAPHENE	ND	ND	ND	ND	ND	ND
B-1016	ND	ND	ND	ND	ND	ND
B-1221	ND	ND	ND	ND	ND	ND
B-1232	ND	ND	ND	ND	ND	ND
B-1242	ND	ND	ND	ND	ND	ND
B-1248	ND	ND	ND	ND	ND	ND
B-1254	ND	ND	ND	ND	ND	ND
B-1260	ND	ND	ND	ND	ND	ND

- Not Detected

A - Not Analyzed

ANALYSIS REPORT FOR WORK ORDER NUMBER 894

TASK: 4, UNITS: ug/Kg, GROUP 8080

DANGB-4-MP21-

SS2

88082049

TEST COMPOUND

ALDRIN	ND
ALPHA-BHC	ND
BETA-BHC	ND
DELTA-BHC	ND
GAMMA-BHC	ND
CHLORDANE	ND
4,4'-DDD	ND
4,4'-DDE	ND
4,4'-DDT	ND
DIELDRIN	ND
ENDOSULFAN I	ND
ENDOSULFAN II	ND
ENDOSULFAN SULFATE	ND
ENDRIN	ND
ENDRIN ALDEHYDE	NA
HEPTACHLOR	ND
HEPTACHLOR EPOXIDE	ND
KEPONE	NA
METHOXYCHLOR	ND
OXAPHENE	ND
CB-1016	ND
PCB-1221	ND
PCB-1232	ND
CB-1242	ND
CB-1248	ND
PCB-1254	ND
PCB-1260	ND

ND - Not Detected

NA - Not Analyzed

CHAIN OF CUSTODY RECORD

894

ES JOB NO. OR001		PROJECT NAME/LOCATION Duluth ANGB/Duluth, Mn.		NO. OF CON- TAINERS	SOILS ANALYSES REQUIRED						SHIP TO: ENGINEERING-SCIENCE LABORATORY, INC. 600 Bancroft Way Berkeley, CA. 94710		
SAMPLER(S): (Signature) <i>Jo Ann Sherman</i> <i>Peter E. Rimerman</i>		SAMPLE DESCRIPTION			SW8010, 8020	SW8270	EPA 418.1	SW8010, 7191	SW1131, 7421				
DATE	TIME											REMARKS	
8/20/88	8:15a	DAN6B-4-MW22 SS1		1	X							882043	
8/20/88	8:15a	DAN6B-4-MW22 SS1		1		X	X						
8/20/88	8:35a	DAN6B-4-MW22 SS2		1	X								
8/20/88	8:35a	DAN6B-4-MW22 SS2		1								882041	
8/20/88	9:20a	DAN6B-4-MW22 SS3		1	X								
8/20/88	9:20a	DAN6B-4-MW22 SS3		1		X	X					882045	
8/20/88	1:45p	DAN6B-4-MW21 SS1		1	X								
8/20/88	1:45p	DAN6B-4-MW21 SS1		1		X	X					882046	
8/20/88	2:20p	DAN6B-4-MW21 SS2		1	X								
8/20/88	3:20p	DAN6B-4-MP21 SS2		1	X								
8/20/88	2:20p	DAN6B-4-MW21 SS2		1			X	X				882047	
8/20/88	3:20p	DAN6B-4-MP21 SS2		1		X	X					882048	
8/20/88	3:55p	DAN6B-4-MW21 SS3		1	X								
8/20/88	3:55p	DAN6B-4-MW21 SS3		1		X	X					882049	
Relinquished by: (Signature) <i>Jo Ann Sherman</i>		Date/Time 8/20/88 4:30p		Received by: (Signature)		Date/Time		Relinquished by: (Signature)		Date/Time		Received by: (Signature)	
Relinquished by: (Signature)		Date/Time		Received for Laboratory by: (Signature) <i>Kathleen C. Lida</i>		Date/Time 8-22-88 1300		Remarks Rec'd cold & intact					

QUALITY CONTROL RESULTS SUMMARY METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: ICP-S-0031-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-19-88
Date Reported: 10-26-88
Dilution Factor: NA
%Moisture: 8.1

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88081969-88081977
88082043-88082049

Laboratory Supervisor Approval:

[Signature]

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	C1	Duplicate C2	RPD	SA	Spike Recovery SR	SSR	PR	Notes
Barium	88081976	88081976	9-10-88	9-11-88	SW6010	<20	57.6	104	58*	218	57.6	271	98	
Cadmium	88081976	98081976	9-10-88	9-11-88	SW6010	<0.5	11.5	9.25	22*	5.44	11.5	14.3	51N	
Chromium	88081976	38081976	9-10-88	9-11-88	SW6010	<1.0	28.9	27.5	5	21.8	28.9	52.2	107	

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* See Case Narrative attached.
N See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$
Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$
NA = Not Applicable
NC = Not Calculated
ND = Not Detected

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY

SAMPLE NO(S).: 88081969-88031976, 88082043-88082049

SAMPLE NO(S).: 88082099-88082101, 88082102-88082104

SAMPLE NO(S).: 88082130-88082133, 88082146-88082148

QC REPORT NO.: ICP-S-0028-88

QC REPORT NO.: ICP-S-0031-88

Due to a suspected interelement matrix interference, all cadmium data at levels reportable by ICP analysis (≥ 1 mg/KG dry weight) are potentially false positives. This is being investigated and follow-up will be provided when available.

QUALITY CONTROL RESULTS SUMMARY METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: AAF-S-0028-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-26-88
Date Reported: 10-13-88
Dilution Factor: See Notes
%Moisture: 7.8

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88082131-88082133, 88082043-88082049
88082100-88082104, 88082146-88082148

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	C1	Duplicate C2	RFD	SA	Spike SR	Recovery SSR	PR	Notes
Arsenic	88082133	88082133	10-06-88	9-23-88	7060	<0.5	<0.5E	<0.5E	NC	4.34	2.71E	4.99E	53	DF=10
Lead	88082133	88082133	10-04-88	9-23-88	7421	<0.5	2.82	3.53	22*	5.42	2.82	8.59	106	DF=11A

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

E See Legend attached.
* See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$ C1 = Concentration One NA = Not Applicable
C2 = Concentration Two NC = Not Calculated

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$ SSR = Spiked Sample Result ND = Not Detected
SR = Sample Result
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001 QC Report No: TPH-S-0050-88
Client: ES Oak Ridge Sample Matrix: Soil
Attn: Bill Hayden Conc. Unit: mg/KG
Address: 710 S. Illinois Avenue Date Received: 8-17-88
Suite F-103 Date Prepared: 9-12-88
Oak Ridge, Tn. 37830 Date Analyzed: 9-13-88
Date Reported: NA
Dilution Factor: 6
%Moisture: 22.2

Project: Duluth ANGB Laboratory Supervisor Approval: *[Signature]*

QC Report for Laboratory Sample No(s):
88081898-88081906, 88082000-88082002
88082043-88082049

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PK	MSD	PR	RPD	Notes
88081903	418.1	<100	<100	1300	1000	77	820	63	20	*

2590

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* Percent recovery (PR) and relative percent difference (RPD) are within ES Laboratory control limits.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$ MS = Spike Sample NA = Not Applicable
MSD = Spike Duplicate NC = Not Calculated
ND = Not Detected

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$ SR = Sample Result
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: TPW-S-0050-88B
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: NA
Date Prepared: 9-12-88
Date Analyzed: 9-13-88
Date Reported: 11-15-88
Dilution Factor: NA
%Moisture: NA

Project: Duluth ANGB
Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88081898-88081906, 88082000-88082002
88082043-88082049

[Signature]

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
Blank	418.1	<100	<100	1000	770	77	680	68	12	

2591

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

$$\text{Relative Percent Difference (RPD)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{\text{SSR} - \text{SR}}{\text{SA}} \times 100$$

MS = Spike Sample
MSD = Spike Duplicate

SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oal: Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082043-88082049
88082099-88082104
88082130-88082133

QC Report No: VGC-S-0042-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 8-26-88
Date Prepared: NA
Date Analyzed: 9-07-88
Date Reported: 10-10-88
Dilution Factor: NA
% Moisture: 8.4

Laboratory Supervisor Approval:

[Signature]

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
58082130	Halocarbons: 8010									
	1,1-dichloroethane	10.9	ND	11.2	103	11.7	107	4	20	58-124
	Trichloroethene	10.9	ND	9.0	83	8.7	80	3	16	75-110
	Chlorobenzene	10.9	ND	9.0	83	9.3	85	3	21	71-125
58082130	Aromatics: 8020									
	Benzene	10.9	ND	9.7	89	9.3	85	4	26	75-123
	Toluene	10.9	0.7	9.8	83	9.7	83	1	16	79-115
	Chlorobenzene	10.9	ND	9.6	88	9.2	84	4	24	82-112

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

* The QC analysis was performed on the confirmatory column. Therefore, the sample result (SR) value for toluene is not the same as the one appearing on the final result form for the sample.

$$\text{Relative Percent Difference (PR)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(\text{MS or MSD}) - \text{SR}}{\text{SA}} \times 100$$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)
NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830

Sample Matrix: Soil
 Conc. Unit: ug/KG
 Date Reported: 10-10-88

Project: Duluth ANGB
 Laboratory Supervisor Approval: *[Signature]*

File ID	Date Analyzed	Fraction	Instru- ment ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
11	9-01-88	VGC	Carbopack	75-09-2	Dichloromethane	3.4	0.5	88082043-88082049
2593								

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No.: OCP-S-0032-88
QC Sample No.: 88082004
Level (Low/Med): Low
Date Reported: 12-27-88

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88082043-88082049

[Signature]

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2280	ND	49.3	65	46-127
Heptachlor	2280	ND	102	135*	35-130
Aldrin	2280	ND	263	347*	34-132
Dieldrin	5690	ND	1425	752*	31-134
Endrin	5690	ND	247	130	42-139
4,4'-DDT	5690	ND	646	341*	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits	
					RPD	REC
Lindane	47.6	63	65	4	50	46-127
Heptachlor	93.0	123	135	9	31	35-130
Aldrin	238	314*	347*	10	43	34-132
Dieldrin	1246	658*	752*	13	38	31-134
Endrin	200	105	130	21	45	42-139
4,4'-DDT	627	331*	341*	3	50	23-134

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: 0 out of 6 outside limits

Spike Recovery: 6 out of 12 outside limits

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No.: OCP-S-0032-88B
QC Sample No.: Blank
Level (Low/Med): Low
Date Reported: 12-27-88

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88082043-88082049

Bill Hayden

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2000	0	59.6	89	46-127
Heptachlor	2000	0	62.8	94	35-130
Aldrin	2000	0	61.9	93	34-132
Dieldrin	5000	0	86.6	52	31-134
Endrin	5000	0	47.8	29	42-139
4,4'-DDT	5000	0	156	94	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits	
					RPD	REC
Lindane	56.5	85	89	5	50	46-127
Heptachlor	57.9	87	94	8	31	35-130
Aldrin	57.4	86	93	8	43	34-132
Dieldrin	181	109	52	71*	38	31-134
Endrin	161	97	29	68*	45	42-139
4,4'-DDT	166	100	94	6	50	23-134

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: 2 out of 6 outside limits

Spike Recovery: 0 out of 12 outside limits

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No.: OCP-S-0032-88
QC Sample No.: 88082047
Level (Low/Med): Med
Date Reported: 11-10-88

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s).:
88082047, 88082043

[Signature]

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	1240	ND	1250	101	46-127
Heptachlor	1240	ND	1340	108	35-130
Aldrin	1240	ND	1390	112	34-132
Dieldrin	3100	ND	3640	117	31-134
Endrin	3100	ND	3350	108	42-139
4,4'-DDT	3100	ND	3030	98	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits	
					RPD	REC
Lindane	1220	98	101	2	50	46-127
Heptachlor	1330	107	108	1	31	35-130
Aldrin	1340	109	112	4	43	34-132
Dieldrin	3680	119	117	1	38	31-134
Endrin	3230	104	108	4	45	42-139
4,4'-DDT	3180	103	98	5	50	23-134

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: 0 out of 6 outside limits

Spike Recovery: 0 out of 12 outside limits

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No.: OCP-S-0032-88B
QC Sample No.: Blank
Level (Low/Med): Med
Date Reported: 11-10-88

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88082043, 88082047

[Signature]

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2000	ND	59.6	89	46-127
Heptachlor	2000	ND	62.8	94	35-130
Aldrin	2000	ND	61.9	93	34-132
Dieldrin	5000	ND	86.6	52	31-134
Endrin	5000	ND	47.8	29*	42-139
4,4'-DDT	5000	ND	156	94	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits	
					RPD	REC
Lindane	56.5	85	89	5	50	46-127
Heptachlor	57.9	87	94	8	31	35-130
Aldrin	57.4	86	93	8	43	34-132
Dieldrin	181	109	52	71*	38	31-134
Endrin	161	97	29*	68*	45	42-139
4,4'-DDT	166	100	94	6	50	23-134

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: 2 out of 6 outside limits

Spike Recovery: 1 out of 12 outside limits

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO.: OCP-S-0032-88
QC REPORT NO.: OCP-S-0032-88B

The low level matrix spike sample required dilution for analysis. This evoked a large amount of inaccuracy in measuring spike recovery, particularly for aldrin, dieldrin and DDT. When spiked blanks were analyzed, recoveries for all spiked compounds were within EPA QC guidelines, but RPD's were poor for dieldrin and endrin.

Although the high level matrix spikes met EPA QC guidelines, analysis of spiked blanks showed one low recovery for endrin and high RPDs for endrin and dieldrin.

The data associated with these analyses were closely examined. No analytical errors were found.

Endrin aldehyde and Kepone were not recoverable because they were removed by the alumina column clean-up used on these samples.

The quality control sample for this batch is from a different project.

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Lab Name:	Engineering Science
Lab Sample No.:	Blank
Matrix:	Soil
Level (low/med):	Med
Extraction:	
(SepF/Cont/Sonc):	Sonc
Date Reported:	11-11-88

Date Extracted: 8-31-88
Date Analyzed (1): 9-27-88
Time Analyzed (1): 05:06
Instrument ID (1): 5890 #2
GC Column ID (1): OV-1

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Date Analyzed (2):
Time Analyzed (2):
Instrument ID (2):
GC Column ID (2):
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This Method Blank applies to the following samples, MS and MSD.

EPA Sample No.	Lab Sample ID (1)	Date Analyzed 1	Lab Sample ID (2)	Date Analyzed 2
-	88082043	9-27-88		
-	88082047	9-27-88		

PESTICIDE METHOD BLANK SUMMARY

Job No.: OR001
 Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830
 Lab Sample No.: 88082043-2049
 Lab File ID:
 Matrix:
 Level (low/med): Low
 Extraction:
 (SepF/Cont/Sonc):

Project: Duluth ANGB

Date Extracted: 8-30-88
 Date Analyzed (1): 9-26-88
 Time Analyzed (1): 21:34
 Instrument ID (1): 5890 #2
 GC Column ID (1): OV-1
 Date Analyzed (2): 10-03-88
 Time Analyzed (2): 19:03
 Instrument ID (2): 5890 #2
 GC Column ID (2): Mixed

This Method Blank applies to the following samples, MS and MSD.

EPA Sample No.	Lab Sample ID (1)	Date Analyzed 1	Lab Sample ID (2)	Date Analyzed 2
	88082044	9-27-88	88082046	10-03-88
	88082045	9-27-88	88082004	10-03-88
	88082046	9-27-88		
	88082048	9-27-88		
	88082049	9-27-88		
	88082004	9-26-88		

ATILE CONTINUING CALIBRATION CHECK

Name: _____ Contract: _____

Code: _____ Case No.: _____ SAS No.: _____

Instrument ID: CARBOPAK _____ Calibration Date(s): 9/1/88

LAB FILE ID: 12.13 _____ Init. Calib. Date(s): 8/30/88 / 8/15/88

COMPOUND	RRF	RRF50	%D
benzyl chloride	0.08	0.17	-111.57
is (2-chloroethoxy)			
thane	0.04		100.00
s (2-chloroisopropyl			
ther	0.26		100.00
omobenzene	1.21	1.35	-11.45
omodichloromethane	3.68	3.28	10.80
omomethane	1.45	1.27	12.50
omomethane	0.26	0.28	-6.25
arbon tetrachloride	3.20	2.60	18.78
loroacetaldehyde			ERR
lorobenzene	1.36	1.22	10.02
loroethane	0.55	0.38	30.05
loroform	4.50	3.46	23.15
-Chlorohexane	0.92	0.81	12.14
Chloroethyl vinyl ether	0.04		100.00
loromethane	0.34	0.39	-16.16
loromethyl methyl ether	0.17		100.00
,m,& p_Chlorotoluenes	3.99	3.15	21.12
bromochloromethane	3.90	3.13	19.67
bromomethane	2.98	2.29	23.28
2_Dichlorobenzene	2.48	1.82	26.64
3_Dichlorobenzene	1.94	1.56	19.83
4_Dichlorobenzene	2.47	1.78	27.76
ichlorodifluormethane	0.54		100.00
1_Dichloroethane	1.95	1.46	25.18
2_Dichloroethane	2.33	2.13	8.57
,1_Dichloroethylene	2.44	1.80	26.20
ans_1,2_dichloroethylene	1.51	1.51	0.26
chloromethane	4.21	2.71	35.69
2_Dichloropropane	2.70	2.03	24.81
3_Dichloropropylene	4.60	3.04	33.93
1,2,2_Tetrachloroethane	6.65	5.46	17.84
1,1,2_Tetrachloroethane	3.61	2.57	28.69
etrachloroethylene	6.65	5.46	17.89
1,1_Trichloroethane	2.20	1.79	18.61
1,2_Trichloroethane	4.60	3.04	33.91
richloroethylene	4.40	3.29	25.26
richlorodifluoroethane	2.19	1.80	17.58
richloromethane	3.59	2.08	42.03
ethyl chloride	1.08	0.73	32.17

ATILE CONTINUING CALIBRATION CHECK

Name: ENGINEERING SCIENCE _____ Contract: _____

Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID.: carbopak Calibration Date(s): 8/30/88 _____

FILE ID: RRF 50 _12_____

Initial calibration: 8/30/88

COMPOUND	RRF	RRF50	%D
Benzene	4.27	4.07	-4.75
Monobenzene	4.19	5.13	22.54
2-Dichlorobenzene	2.24	1.88	-16.29
3-Dichlorobenzene	2.73	2.13	-21.81
4-Dichlorobenzene	3.09	2.13	-30.92
Tol Benzene	2.54	3.49	37.42
Toluene	3.22	3.72	15.56
Hexenes	8.05	6.75	-16.15

DATA PACKAGE #46

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ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the soil samples received
by this laboratory on 9-01-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
8809 2244	DANGB-BG-MW32-SS1	AS-F	8-31-88		10-11-88	
8809 2244	DANGB-BG-MW32-SS1	BA-I	8-31-88		10-20-88	
8809 2244	DANGB-BG-MW32-SS1	CD-F	8-31-88		10-20-88	
8809 2244	DANGB-BG-MW32-SS1	CR-F	8-31-88		10-20-88	
8809 2244	DANGB-BG-MW32-SS1	HG-C	8-31-88		9-22-88	
8809 2244	DANGB-BG-MW32-SS1	PB-F	8-31-88		10-20-88	
8809 2244	DANGB-BG-MW32-SS1	418.1	8-31-88	9-22-88	9-23-88	
8809 2244	DANGB-BG-MW32-SS1	MOIS	8-31-88		9-09-88	
8809 2244	DANGB-BG-MW32-SS1	8010	8-31-88		9-13-88	9-12-88
8809 2244	DANGB-BG-MW32-SS1	8020	8-31-88		9-13-88	9-11-88
8809 2244	DANGB-BG-MW32-SS1	8080	8-31-88	9-09-88	10-05-88	10-07-88
8809 2244	DANGB-BG-MW32-SS1	8270	8-31-88	9-10-88	10-21-88	

* If applicable



ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88092245	DANGB-BG-MW32-SS4	AS-F	8-31-88		10-11-88	
88092245	DANGB-BG-MW32-SS4	BA-I	8-31-88		10-20-88	
88092245	DANGB-BG-MW32-SS4	CD-F	8-31-88		10-20-88	
88092245	DANGB-BG-MW32-SS4	CR-F	8-31-88		10-20-88	
88092245	DANGB-BG-MW32-SS4	HG-C	8-31-88		9-22-88	
88092245	DANGB-BG-MW32-SS4	PB-F	8-31-88		10-22-88	
88092245	DANGB-BG-MW32-SS4	418.1	8-31-88	9-22-88	9-23-88	
88092245	DANGB-BG-MW32-SS4	MOIS	8-31-88		9-09-88	
88092245	DANGB-BG-MW32-SS4	8010	8-31-88		9-13-88	9-12-88
88092245	DANGB-BG-MW32-SS4	8020	8-31-88		9-13-88	9-11-88
88092245	DANGB-BG-MW32-SS4	8080	8-31-88	9-09-88	10-05-88	
88092245	DANGB-BG-MW32-SS4	8270	8-31-88	9-10-88	10-21-88	
88092246	DANGB-SGC4-SS2	AS-F	8-31-88		10-11-88	
88092246	DANGB-SGC4-SS2	BA-I	8-31-88		10-20-88	
88092246	DANGB-SGC4-SS2	CD-F	8-31-88		10-20-88	
88092246	DANGB-SGC4-SS2	CR-F	8-31-88		10-20-88	
88092246	DANGB-SGC4-SS2	HG-C	8-31-88		9-22-88	
88092246	DANGB-SGC4-SS2	PB-F	8-31-88		10-22-88	
88092246	DANGB-SGC4-SS2	418.1	8-31-88	9-22-88	9-23-88	
88092246	DANGB-SGC4-SS2	MOIS	8-31-88		9-09-88	
88092246	DANGB-SGC4-SS2	8010	8-31-88		9-12-88	9-13-88
88092246	DANGB-SGC4-SS2	8020	8-31-88		9-13-88	9-11-88
88092246	DANGB-SGC4-SS2	8080	8-31-88	9-09-88	10-05-88	
88092246	DANGB-SGC4-SS2	8270	8-31-88	9-10-88	10-21-88	

* If applicable



ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
8809 2247	DANGB-SGC4-SS1	MOIS	8-31-88		9-09-88	
8809 2247	DANGB-SGC4-SS1	8010	8-31-88		9-12-88	9-13-88
8809 2247	DANGB-SGC4-SS1	8020	8-31-88		9-13-88	9-11-88
8809 2247	DANGB-SGC4-SS1	8080	8-31-88	9-09-88	10-05-88	
8809 2247	DANGB-SGC4-SS1	S270	8-31-88	9-10-88	10-21-88	
8809 2248	DANGB-SGE4-SS1	AS-F	8-31-88		10-11-88	
8809 2248	DANGB-SGE4-SS1	BA-I	8-31-88		10-20-88	
8809 2248	DANGB-SGE4-SS1	CD-F	8-31-88		10-20-88	
8809 2248	DANGB-SGE4-SS1	CR-F	8-31-88		10-20-88	
8809 2248	DANGB-SGE4-SS1	HG-C	8-31-88		9-22-88	
8809 2248	DANGB-SGE4-SS1	PB-F	8-31-88		10-20-88	
8809 2248	DANGB-SGE4-SS1	418.1	8-31-88	9-22-88	9-23-88	
8809 2248	DANGB-SGE4-SS1	MOIS	8-31-88		9-09-88	
8809 2248	DANGB-SGE4-SS1	8010	8-31-88		9-13-88	9-12-88
8809 2248	DANGB-SGE4-SS1	8020	8-31-88		9-13-88	9-11-88
8809 2248	DANGB-SGE4-SS1	8080	8-31-88	9-09-88	10-05-88	
8809 2248	DANGB-SGE4-SS1	S270	8-31-88	9-10-88	10-24-88	
8809 2249	DANGB-SGE4-SS1	AS-F	8-31-88		10-11-88	
8809 2249	DANGB-SGE4-SS1	BA-I	8-31-88		10-20-88	
8809 2249	DANGB-SGE4-SS1	CD-F	8-31-88		10-20-88	
8809 2249	DANGB-SGE4-SS1	CR-F	8-31-88		10-20-88	
8809 2249	DANGB-SGE4-SS1	HG-C	8-31-88		9-22-88	
8809 2249	DANGB-SGE4-SS1	PB-F	8-31-88		10-22-88	
8809 2249	DANGB-SGE4-SS1	418.1	8-31-88	9-22-88	9-23-88	
8809 2249	DANGB-SGE4-SS1	MOIS	8-31-88		9-09-88	
8809 2249	DANGB-SGE4-SS1	8010	8-31-88		9-13-88	9-12-88
8809 2249	DANGB-SGE4-SS1	8020	8-31-88		9-13-88	9-11-88
8809 2249	DANGB-SGE4-SS1	8080	8-31-88	9-09-88	10-05-88	
8809 2249	DANGB-SGE4-SS1	8270	8-31-88	9-10-88	10-24-88	

* If applicable

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88092244-88092249
WORK ORDER NO.: 940

These soil samples were received at the ES Berkeley Laboratory on 9-01-88. They were received cold and intact.

The initial 8270 analysis of these samples was performed one day out of holding time. Analysis of 88092247, 88092248 and 88092249 showed low area counts for the last internal standard in each sample. Re-analysis of the extract of sample 88092247 did not change the result. This indicates a matrix effect. Re-analysis of samples 88092248 and 88092249 resulted in good area counts for all internal standards. Results of the second analysis for these two samples are presented in this report. Since no target compounds were found in these samples, the low internal standard area counts should not affect the results of these analyses.

Sample 88092247 (DANGB,SGC4,SS1) was broken in-house, therefore, the metals and petroleum hydrocarbons could not be analyzed. This sample was re-sampled in order to complete the requested analysis.

12/27/88

ANALYSIS REPORT

WORK ORDER NUMBER: 940
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/01/88

APPROVED BY

Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 2, UNITS: mg/Kg

	DANGB,BG,MW32, SS1	DANGB,BG,MW32, SS4	DANGB,SGC4,SS2	DANGB,SGC4,SS1	DANGB,SGE4,SS1	DANGB,SGE4,SS2
TEST COMPOUND	88092244	88092245	88092246	88092247	88092248	88092249
ACID DIG SOIL	NA	NA	NA	NT	NA	NA
ARSENIC	<5.0E	<5.0E	5.4E	NT	<5.0E	<5.0
BARIUM	103	93.4	57.9	NT	39.7	44.0
CADMIUM	7.8N	6.8N	19.2N	NT	5.7N	6.0N
CHROMIUM	17.1	14.4	44.6	NT	25.9	26.6
MERCURY	<0.1	<0.1	<0.1	NT	<0.1	<0.1
LEAD	9.9	16.6	126	NT	4.5	4.5

NA- NOT APPLICABLE

NT- NOT TESTED

ND - Not Detected

2609

ANALYSIS REPORT

ORK ORDER NUMBER: 940
OB NUMBER : Z80000000440
ORK ORDER DATE : 09/01/88

APPROVED BY


Lab Supervisor

REPORT DATA:
S OAK RIDGE/DULUTH ANGB
10 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

ASK: 3, UNITS: mg/Kg

	DANGB,BG,MW32, SS1 88092244	DANGB,BG,MW32, SS4 88092245	DANGB,SGC4,SS2 88092246	DANGB,SGC4,SS1 88092247	DANGB,SGE4,SS1 88092248	DANGB,SGE4,SS2 88092249
EST COMPOUND						
18.1 PETROLEUM HYDROCARBONS	21	13	16	NT	31	23
MOISTURE	17.4	15.0	5.6	5.7	10.0	8.5

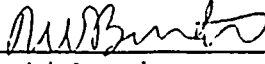
NT - NOT TESTED
ND - Not Detected

12/27/88

ANALYSIS REPORT

WORK ORDER NUMBER: 940
 JOB NUMBER : ZB00G0000440
 WORK ORDER DATE : 09/01/88

APPROVED BY


 Lab Supervisor

REPORT DATA:

ES OAK RIDGE/DULUTH ANGB
 710 S. ILLINOIS AVE. STE. S103
 OAK RIDGE, TN 37830
 BILL HAYDEN

CLIENT DATA:

ES OAK RIDGE/DULUTH ANGB (134)
 710 S. ILLINOIS AVE. STE. S103
 OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
 CONTACT : BILL HAYDEN
 (615)-481-3920

TASK: 4, UNITS: ug/Kg, GROUP 8010

	DANGB,BG,MW32, SS1	DANGB,BG,MW32, SS4	DANGB,SGC4,SS2	DANGB,SGC4,SS1	DANGB,SGE4,SS1	DANGB,SGE4,SS2
TEST COMPOUND	88092244	88092245	88092246	88092247	88092248	88092249
BENZYL CHLORIDE	ND	ND	ND	ND	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND	ND	ND	ND	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND	ND	ND	ND	ND	ND
BROMOBENZENE	ND	ND	ND	ND	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND	ND	ND	ND
BROMOFORM	ND	ND	ND	ND	ND	ND
BROMOETHANE	ND	ND	ND	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND	ND	ND	ND
CHLORACETALDEHYDE	ND	ND	ND	ND	ND	ND
CHLORAL	ND	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND
CHLOROETHANE	ND	ND	ND	ND	ND	ND
CHLOROFORM	ND	ND	ND	ND	3.5	ND
1-CHLOROHEXANE	ND	ND	ND	ND	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND	ND	ND	ND	ND
CHLOROMETHANE	ND	ND	ND	ND	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND	ND	ND	ND	ND
CHLOROTOLUENE	ND	ND	ND	ND	ND	ND
DIBROMOCHLOROMETHANE	ND	ND	ND	ND	ND	ND
DIBROMOMETHANE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
DICHLOROMETHANE	1.2B	0.41B	0.30B	0.41B	4.6B	0.55B
1,2-DICHLOROPROPANE	ND	ND	ND	ND	ND	ND

ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 940

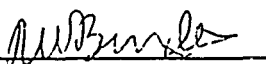
TEST COMPOUND	DANGB,BG,MW32, SS1 88092244	DANGB,BG,MW32, SS4 88092245	DANGB,SGC4,SS2 88092246	DANGB,SGC4,SS1 88092247	DANGB,SGE4,SS1 88092248	DANGB,SGE4,SS2 88092249
3-DICHLOROPROPYLENE	ND	ND	ND	ND	ND	ND
1,1,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
TETRACHLOROETHYLENE	ND	ND	ND	ND	ND	ND
1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
TRICHLOROFLUOROMETHANE	ND	ND	ND	ND	ND	ND
TRICHLOROPROPANE	ND	ND	ND	ND	ND	ND
VINYL CHLORIDE	ND	ND	ND	ND	ND	ND

- Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 940
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/01/88

APPROVED BY


Lab Supervisor

REPORT DATA:

ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:

ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

ASK: 4, UNITS: ug/Kg, GROUP 8020

TEST COMPOUND	DANGB,BG,MW32, SS1	DANGB,BG,MW32, SS4	DANGB,SGC4,SS2	DANGB,SGC4,SS1	DANGB,SGE4,SS1	DANGB,SGE4,SS2
	88092244	88092245	88092246	88092247	88092248	88092249
BENZENE	ND	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
ETHYL BENZENE	ND	ND	ND	ND	ND	ND
TOLUENE	ND	1.0	0.76	0.92	140	140
XYLENES	ND	ND	ND	ND	ND	ND

ND - Not Detected

ANALYSIS REPORT

ORK ORDER NUMBER: 940
OB NUMBER : ZB0000000440
ORK ORDER DATE : 09/01/88

APPROVED BY


Lab Supervisor

REPORT DATA:

S OAK RIDGE/DULUTH ANGB
10 S. ILLINOIS AVE. STE. S103
AK RIDGE, TN 37830
ILL HAYDEN

CLIENT DATA:

ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

ONTRACT / PO # : OR001
ONTACT : BILL HAYDEN
(615)-481-3920

ASK: 4, UNITS: ug/Kg, GROUP 8080

	DANGB,BG,MW32, SS1	DANGB,BG,MW32, SS4	DANGB,SGC4,SS2	DANGB,SGC4,SS1	DANGB,SGE4,SS1	DANGB,SGE4,SS2
EST COMPOUND	68092244	88092245	88092246	88092247	88092248	88092249
DRIN	ND	ND	ND	ND	ND	ND
PHA-BHC	ND	ND	ND	ND	ND	ND
ETA-BHC	ND	ND	ND	ND	ND	ND
ELTA-BHC	ND	ND	ND	ND	ND	ND
AMMA-BHC	ND	ND	ND	ND	ND	ND
LORDANE	ND	ND	ND	ND	ND	ND
,4'-DDD	ND	ND	ND	ND	ND	ND
,4'-DDE	ND	ND	ND	ND	ND	ND
,4'-DDT	ND	ND	ND	42	ND	ND
ELDRIN	ND	ND	ND	ND	ND	ND
DOSULFAN I	ND	ND	ND	ND	ND	ND
DOSULFAN II	ND	ND	ND	ND	ND	ND
DOSULFAN SULFATE	ND	ND	ND	ND	ND	ND
DRIN	ND	ND	ND	ND	ND	ND
DRIN ALDEHYDE	NA	NA	NA	NA	NA	NA
PTACHLOR	ND	ND	ND	ND	ND	ND
PTACHLOR EPOXIDE	ND	ND	ND	ND	ND	ND
PONE	NA	NA	NA	NA	NA	NA
THOXYCHLOR	ND	ND	ND	ND	ND	ND
XAPHENE	ND	ND	ND	ND	ND	ND
CB-1016	ND	ND	ND	ND	ND	ND
CB-1221	ND	ND	ND	ND	ND	ND
CB-1232	ND	ND	ND	ND	ND	ND
CB-1242	ND	ND	ND	ND	ND	ND
CB-1248	ND	ND	ND	ND	ND	ND
CB-1254	ND	ND	1100	300	ND	ND
CB-1260	ND	ND	ND	ND	ND	ND

A- NOT ANALYZED
J - Not Detected

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

page 1 of 5

Date Received: September 1, 1988
Date Reported: December 8, 1988

Work Order: 940
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88092244	88092245
Sample No.:	DANGB-BG-MW32- SS1	DANGB-BG-MW32- SS4
Date Sampled:	8-31-88	8-31-88
Time Sampled:	10:45	10:45
Date Extracted:	9-10-88	9-10-88
Date Analyzed:	10-21-88	10-21-88
Percent Moisture:	17	15

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
1,3-Dichlorobenzene	330	ND	ND
1,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Bis(2-chloroethyl)ether	330	ND	ND
1,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Bis(2-chloroisopropyl)ether	330	ND	ND
N-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
Nitrobenzene	330	ND	ND
Isophorone	330	ND	ND
Naphthalene	330	ND	ND
Bis(2-chloroethoxy)methane	330	ND	ND
2-Chloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
Acenaphthylene	330	ND	ND
Acenaphthene	330	ND	ND
Dimethyl phthalate	330	ND	ND
2,6-Dinitrotoluene	330	ND	ND
Fluorene	330	ND	ND
2,4-Dinitrotoluene	330	ND	ND
Diethyl phthalate	330	ND	ND
N-Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

Priority Pollutant Analysis
 . Base Neutrals - SW 8270
 Matrix: Soil
 (continued)

page 2 of 5

Date Received: September 1, 1988
 Date Reported: December 8, 1988

Work Order: 940
 Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGE
 Address: 710 S. Illinois Ave, Suite F-103
 Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88092244	88092245
Sample No.:	DANGE-BG-MW32- SS1	DANGE-BG-MW32- SS4
Date Sampled:	8-31-88	8-31-88
Time Sampled:	10:45	10:45
Date Extracted:	9-10-88	9-10-88
Date Analyzed:	10-21-88	10-21-88
Percent Moisture:	17	15

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Dibutyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Butyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
4-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benزيدine	2000	ND	ND
3,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Page 3 of 5

Date Received: September 1, 1988

Work Order: 940

Date Reported: December 8, 1988

Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88092244	88092245
Sample No.:	DANGB-BG-MW32- SS1	DANGB-BG-MW32- SS4
Date Sampled:	8-31-88	8-31-88
Time Sampled:	10:45	10:45
Date Extracted:	9-10-88	9-10-88
Date Analyzed:	10-21-88	10-21-88
Percent Moisture:	17	15

Compound	Detection Limits ug/kg	Analytical Results (dry weight)	
		ug/kg	ug/kg
Acetophenone	--*	ND	ND
Aniline	--*	ND	ND
4-Aminobiphenyl	--*	ND	ND
4-Chloroaniline	660	ND	ND
1-Chloronaphthalene	--*	ND	ND
Dibenzofuran	330	ND	ND
p-Dimethylaminoazobenzene	--*	ND	ND
7,12-Dimethylbenz(a)anthracene	--*	ND	ND
a-,a-Dimethylphenethylamine	--*	ND	ND
Diphenylamine	--*	ND	ND
1,2-Diphenylhydrazine	--*	ND	ND
Ethyl methanesulfonate	--*	ND	ND
3-Methylcholanthrene	--*	ND	ND
Methyl methanesulfonate	--*	ND	ND
2-Methylnaphthalene	330	ND	ND
1-Naphthylamine	--*	ND	ND
2-Naphthylamine	--*	ND	ND
2-Nitroaniline	1600	ND	ND
3-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
N-Nitroso-di-n-butylamine	--*	ND	ND
N-Nitrosopiperidine	--*	ND	ND
Pentachlorobenzene	--*	ND	ND
Pentachloronitrobenzene	--*	ND	ND
Phenacetin	--*	ND	ND
2-Picoline	--*	ND	ND
Pronamide	--*	ND	ND
1,2,4,5-Tetrachlorobenzene	--*	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

page 4 of 5

Date Received: September 1, 1988
Date Reported: December 8, 1988

Work Order: 940
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN:Mr. Bill Hayden

Lab Number:	88092244	88092245
Sample No.:	DANGB-BG-MW32- SS1	DANGB-BG-MW32- SS4
Date Sampled:	8-31-88	8-31-88
Time Sampled:	10:45	10:45
Date Extracted:	9-10-88	9-10-88
Date Analyzed:	10-21-88	10-21-88
Percent Moisture:	17	15

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Alpha-BHC	--*	ND	ND
Gamma-BHC	--*	ND	ND
Beta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Aldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
Dieldrin	500	ND	ND
1,4'-DDE	1000	ND	ND
Endrin	--*	ND	ND
Endosulfan II	--*	ND	ND
1,4'-DDD	500	ND	ND
1,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	--*	ND	ND
Endrin Ketone	--*	ND	ND
Chlordane	2000	ND	ND
Methoxychlor	--*	ND	ND
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1248	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

* EPA has not yet determined detection limits for these compounds.

2618

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

page 5 of 5

Date Received: September 1, 1988
Date Reported: December 8, 1988

Work Order: 940
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88092244	88092245
Sample No.:	DANGB-BG-MW32-	DANGB-BG-MW32-
	SS1	SS4
Date Sampled:	8-31-88	8-31-88
Time Sampled:	10:45	10:45
Date Extracted:	9-10-88	9-10-88
Date Analyzed:	10-21-88	10-21-88
Percent Moisture:	17	15

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
2-Chlorophenol	330	ND	ND
2-Nitrophenol	330	ND	ND
Phenol	330	ND	ND
2,4-Dimethylphenol	330	ND	ND
2,4-Dichlorophenol	330	ND	ND
2,4,6-Trichlorophenol	330	ND	ND
4-Chloro-3-methylphenol	660	ND	ND
2,4-Dinitrophenol	1600	ND	ND
2,6-Dichlorophenol	--*	ND	ND
2-Methyl-4,6-Dinitrophenol	1600	ND	ND
Pentachlorophenol	1600	ND	ND
4-Nitrophenol	1600	ND	ND
Benzoic Acid	1600	ND	ND
2-Methylphenol	330	ND	ND
3- & 4-Methylphenol	330	ND	ND
2,3,4,6-Tetrachlorophenol	--*	ND	ND
2,4,5-Trichlorophenol	330	ND	ND

Laura Kuek

Analyst

M. B. B. B.

Laboratory Supervisor

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

page 1 of 5.

Date Received: September 1, 1988
Date Reported: December 8, 1988

Work Order: 940
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88092246	88092247
Sample No.:	DANGB-SG-C4- SS2	DANGB-SG-C4- SS1
Date Sampled:	8-31-88	8-31-88
Time Sampled:	11:40	11:40
Date Extracted:	9-10-88	9-10-88
Date Analyzed:	10-21-88	10-21-88
Percent Moisture:	6	6

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
1,3-Dichlorobenzene	330	ND	ND
1,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Bis(2-chloroethyl)ether	330	ND	ND
1,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Bis(2-chloroisopropyl)ether	330	ND	ND
N-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
Nitrobenzene	330	ND	ND
Isophorone	330	ND	ND
Naphthalene	330	ND	ND
Bis(2-chloroethoxy)methane	330	ND	ND
2-Chloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
Acenaphthylene	330	ND	ND
Acenaphthene	330	ND	ND
Dimethyl phthalate	330	ND	ND
2,6-Dinitrotoluene	330	ND	ND
Fluorene	330	ND	ND
2,4-Dinitrotoluene	330	ND	ND
Diethyl phthalate	330	ND	ND
N-Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

page 2 of 5

Date Received: September 1, 1988
Date Reported: December 8, 1988

Work Order: 940
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88092246	88092247
Sample No.:	DANGB-SG-C4- SS2	DANGB-SG-C4- SS1
Date Sampled:	8-31-88	8-31-88
Time Sampled:	11:40	11:40
Date Extracted:	9-10-88	9-10-88
Date Analyzed:	10-21-88	10-21-88
Percent Moisture:	6	6

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Dibutyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Butyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
4-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benzidine	2000	ND	ND
3,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Page 3 of 5

Date Received: September 1, 1988
Date Reported: December 8, 1988

Work Order: 940
Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88092246	88092247
Sample No.:	DANGB-SG-C4- SS2	DANGB-SG-C4- SS1
Date Sampled:	8-31-88	8-31-88
Time Sampled:	11:40	11:40
Date Extracted:	9-10-88	9-10-88
Date Analyzed:	10-21-88	10-21-88
Percent Moisture:	6	6

Compound	Detection Limits ug/kg	Analytical Results (dry weight)	
		ug/kg	ug/kg
Acetophenone	--*	ND	ND
Aniline	--*	ND	ND
4-Aminobiphenyl	--*	ND	ND
4-Chloroaniline	660	ND	ND
1-Chloronaphthalene	--*	ND	ND
Dibenzofuran	330	ND	ND
p-Dimethylaminoazobenzene	--*	ND	ND
7,12-Dimethylbenz(a)anthracene	--*	ND	ND
a-,a-Dimethylphenethylamine	--*	ND	ND
Diphenylamine	--*	ND	ND
1,2-Diphenylhydrazine	--*	ND	ND
Ethyl methanesulfonate	--*	ND	ND
3-Methylcholanthrene	--*	ND	ND
4-Methyl methanesulfonate	--*	ND	ND
2-Methylnaphthalene	330	ND	ND
1-Naphthylamine	--*	ND	ND
2-Naphthylamine	--*	ND	ND
2-Nitroaniline	1600	ND	ND
3-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
N-Nitroso-di-n-butylamine	--*	ND	ND
N-Nitrosopiperidine	--*	ND	ND
Pentachlorobenzene	--*	ND	ND
Pentachloronitrobenzene	--*	ND	ND
Phenacetin	--*	ND	ND
2-Picoline	--*	ND	ND
Pronamide	--*	ND	ND
1,2,4,5-Tetrachlorobenzene	--*	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

page 4 of 5

Date Received: September 1, 1988
Date Reported: December 8, 1988

Work Order: 940
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN:Mr. Bill Hayden

Lab Number:	88092246	88092247
Sample No.:	DANGB-SG-C1- SS2	DANGB-SG-C4- SS1
Date Sampled:	8-31-88	8-31-88
Time Sampled:	11:40	11:40
Date Extracted:	9-10-88	9-10-88
Date Analyzed:	10-21-88	10-21-88
Percent Moisture:	6	6

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Alpha-BHC	--*	ND	ND
Gamma-BHC	--*	ND	ND
Beta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Aldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
Dieldrin	500	ND	ND
4,4'-DDE	1000	ND	ND
Endrin	--*	ND	ND
Endosulfan II	--*	ND	ND
4,4'-DDD	500	ND	ND
4,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	--*	ND	ND
Endrin Ketone	--*	ND	ND
Chlordane	2000	ND	ND
Methoxychlor	--*	ND	ND
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1248	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

page 5 of 5

Date Received: September 1, 1988
Date Reported: December 8, 1988

Work Order: 940
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88092246	88092247
Sample No.:	DANGB-SG-C4-	DANGB-SG-C4-
	SS2	SS1
Date Sampled:	8-31-88	8-31-88
Time Sampled:	11:40	11:40
Date Extracted:	9-10-88	9-10-88
Date Analyzed:	10-21-88	10-21-88
Percent Moisture:	6	6

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
2-Chlorophenol	330	ND	ND
2-Nitrophenol	330	ND	ND
Phenol	330	ND	ND
2,4-Dimethylphenol	330	ND	ND
2,4-Dichlorophenol	330	ND	ND
2,4,6-Trichlorophenol	330	ND	ND
4-Chloro-3-methylphenol	660	ND	ND
2,4-Dinitrophenol	1600	ND	ND
2,6-Dichlorophenol	--*	ND	ND
2-Methyl-4,6-Dinitrophenol	1600	ND	ND
Pentachlorophenol	1600	ND	ND
1-Nitrophenol	1600	ND	ND
Benzoic Acid	1600	ND	ND
1-Methylphenol	330	ND	ND
3- & 4-Methylphenol	330	ND	ND
1,3,4,6-Tetrachlorophenol	--*	ND	ND
2,4,5-Trichlorophenol	330	ND	ND

Laura Kirk

Analyst

Bill Hayden

Laboratory Supervisor

* EPA has not yet determined detection limits for these compounds.

o = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

page 1 of 5

Date Received: September 1, 1988

Work Order: 940

Date Reported: December 8, 1988

Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lap Number:	88092248	88092249
Sample No.:	DANGB-SG-E4-SS1	DANGB-SG-E4-SS2
Date Sampled:	8-31-88	8-31-88
Time Sampled:	11:20	11:20
Date Extracted:	9-10-88	9-10-88
Date Analyzed:	10-24-88	10-24-88
Percent Moisture:	10	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
1,3-Dichlorobenzene	330	ND	ND
1,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Bis(2-chloroethyl)ether	330	ND	ND
1,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Bis(2-chloroisopropyl)ether	330	ND	ND
N-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
Nitrobenzene	330	ND	ND
Isophorone	330	ND	ND
Naphthalene	330	ND	ND
Bis(2-chloroethoxy)methane	330	ND	ND
2-Chloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
Acenaphthylene	330	ND	ND
Acenaphthene	330	ND	ND
Dimethyl phthalate	330	ND	ND
2,6-Dinitrotoluene	330	ND	ND
Fluorene	330	ND	ND
2,4-Dinitrotoluene	330	ND	ND
Diethyl phthalate	330	ND	ND
N-Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

page 2 of 5

Date Received: September 1, 1988
Date Reported: December 8, 1988

Work Order: 940
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lap Number:	88092248	88092249
Sample No.:	DANGB-SG-E4- SS1	DANGB-SG-E4- SS2
Date Sampled:	8-31-88	8-31-88
Time Sampled:	11:20	11:20
Date Extracted:	9-10-88	9-10-88
Date Analyzed:	10-24-88	10-24-88
Percent Moisture:	10	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Dibutyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Butyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
4-Bromophenyl phenyl ether	330	ND	ND
benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
benzo(b)fluoranthene	330	ND	ND
benzo(k)fluoranthene	330	ND	ND
benzidine	2000	ND	ND
3,3'-Dichlorobenzidine	660	ND	ND
benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Page 3 of 5

Date Received: September 1, 1988
Date Reported: December 8, 1988

Work Order: 940
Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88092248	88092249
Sample No.:	DANGB-SG-E4-SS1	DANGB-SG-E4-SS2
Date Sampled:	8-31-88	8-31-88
Time Sampled:	11:20	11:20
Date Extracted:	9-10-88	9-10-88
Date Analyzed:	10-24-88	10-24-88
Percent Moisture:	10	8

Compound	Detection Limits ug/kg	Analytical Results (dry weight) ug/kg	
Acetophenone	--*	ND	ND
Aniline	--*	ND	ND
4-Aminobiphenyl	--*	ND	ND
4-Chloroaniline	660	ND	ND
1-Chloronaphthalene	--*	ND	ND
Dibenzofuran	330	ND	ND
p-Dimethylaminoazobenzene	--*	ND	ND
7,12-Dimethylbenz(a)anthracene	--*	ND	ND
a-,a-Dimethylphenethylamine	--*	ND	ND
Diphenylamine	--*	ND	ND
1,2-Diphenylhycrazine	--*	ND	ND
Ethyl methanesulfonate	--*	ND	ND
3-Methylcholanthrene	--*	ND	ND
Methyl methanesulfonate	--*	ND	ND
2-Methylnaphthalene	330	ND	ND
1-Naphthylamine	--*	ND	ND
2-Naphthylamine	--*	ND	ND
2-Nitroaniline	1600	ND	ND
3-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
N-Nitroso-di-n-butylamine	--*	ND	ND
N-Nitrosopiperidine	--*	ND	ND
Pentachlorobenzene	--*	ND	ND
Pentachloronitrobenzene	--*	ND	ND
Phenacetin	--*	ND	ND
2-Picoline	--*	ND	ND
Pronamide	--*	ND	ND
1,2,4,5-Tetrachlorobenzene	--*	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

page 4 of 5

Date Received: September 1, 1988
Date Reported: December 8, 1988

Work Order: 940
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN:Mr. Bill Hayden

Lab Number:	88092248	88092249
Sample No.:	DANGB-SG-E4- SS1	DANGB-SG-E4- SS2
Date Sampled:	8-31-88	8-31-88
Time Sampled:	11:20	11:20
Date Extracted:	9-10-88	9-10-88
Date Analyzed:	10-24-88	10-24-88
Percent Moisture:	10	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Alpha-BHC	--*	ND	ND
Gamma-BHC	--*	ND	ND
Beta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Aldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
Dieldrin	500	ND	ND
4,4'-DDE	1000	ND	ND
Endrin	--*	ND	ND
Endosulfan II	--*	ND	ND
2,4'-DDD	500	ND	ND
4,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	--*	ND	ND
Endrin Ketone	--*	ND	ND
Chlordane	2000	ND	ND
Methoxychlor	--*	ND	ND
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1248	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

page 5 of 5

Date Received: September 1, 1988
Date Reported: December 8, 1988

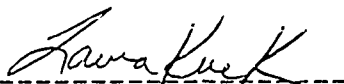
Work Order: 940
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

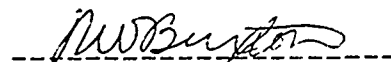
ATTN: Mr. Bill Hayden

Lab Number:	88092248	88092249
Sample No.:	DANGB-SG-E4-	DANGB-SG-E4-
	SS1	SS2
Date Sampled:	8-31-88	8-31-88
Time Sampled:	11:20	11:20
Date Extracted:	9-10-88	9-10-88
Date Analyzed:	10-24-88	10-24-88
Percent Moisture:	10	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
2-Chlorophenol	330	ND	ND
2-Nitrophenol	330	ND	ND
Phenol	330	ND	ND
2,4-Dimethylphenol	330	ND	ND
2,4-Dichlorophenol	330	ND	ND
2,4,6-Trichlorophenol	330	ND	ND
4-Chloro-3-methylphenol	660	ND	ND
2,4-Dinitrophenol	1600	ND	ND
2,6-Dichlorophenol	--*	ND	ND
2-Methyl-4,6-Dinitrophenol	1600	ND	ND
Pentachlorophenol	1600	ND	ND
4-Nitrophenol	1600	ND	ND
Benzoic Acid	1600	ND	ND
2-Methylphenol	330	ND	ND
3- & 4-Methylphenol	330	ND	ND
2,3,4,6-Tetrachlorophenol	--*	ND	ND
2,4,5-Trichlorophenol	330	ND	ND



Analyst



Laboratory Supervisor

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

ENGINEERING-SCIENCE

CHAIN OF CUSTODY RECORD 940-1

ES JOB NO. OR001	PROJECT NAME/LOCATION Duluth-ANGB/Duluth, Mn.	PROJECT NAME/LOCATION ENGINEERING-SCIENCE LABORATORY, INC. 600 Bancroft Way Berkeley, CA. 94710	SOILS ANALYSES REQUIRED							SHIP TO: ENGINEERING-SCIENCE LABORATORY, INC. 600 Bancroft Way Berkeley, CA. 94710	REMARKS
			SW 8010, 8020	SW 8080	SW 8270	EPA 418.1	SW 8010, 7080, 7191	SW 7131, 7421, 7471			
DATE	TIME	SAMPLE DESCRIPTION	NO. OF CON- TAINERS	SW 8010, 8020	SW 8080	SW 8270	EPA 418.1	SW 8010, 7080, 7191	SW 7131, 7421, 7471		
8/31/88	10:45	DAN6B BG MW 32 SS 1	1	X	X	X	X	X	X	Resample (Discard original Sample 8-27-88)	
8/31/88	10:45	DAN6B BG MW 32 SS 4	1	X	X	X	X	X	X		
8/31/88	10:45	DAN6B BG MW 32 SS 1	1	X	X	X	X	X	X	Resample (Discard original Sample 8-27-88)	
8/31/88	10:45	DAN6B BG MW 32 SS 4	1	X	X	X	X	X	X		
8/31/88	11:40	DAN6B BG 64 SS 2	1	X	X	X	X	X	X		
8/31/88	11:40	DAN6B BG 64 SS 2	1	X	X	X	X	X	X		
8/31/88	11:40	DAN6B BG 64 SS 1	1	X	X	X	X	X	X		
8/31/88	11:40	DAN6B BG 64 SS 1	1	X	X	X	X	X	X		
8/31/88	11:20	DAN6B BG 64 SS 1	1	X	X	X	X	X	X		
8/31/88	11:20	DAN6B BG 64 SS 2	1	X	X	X	X	X	X		
8/31/88	11:20	DAN6B BG 64 SS 1	1	X	X	X	X	X	X		
8/31/88	11:20	DAN6B BG 64 SS 2	1	X	X	X	X	X	X		
NOTE: All 6010 Analysis for Barium only											
Relinquished by: (Signature)			Received by: (Signature)			Relinquished by: (Signature)			Received by: (Signature)		
Date/Time			Date/Time			Date/Time			Date/Time		
8/31/88 1802											
Relinquished by: (Signature)			Received for Laboratory by: (Signature)			Date/Time			Remarks		
8/31/88 15:00			Bill Friedman			9/1/88 15:00			Relic cold & intact		

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO(S).: AAF-S-0035-88

As a result of extreme sample matrix interference, dilution was required for sample analysis. The reporting limit and MDL for the analyte(s) listed have increased as shown.

<u>Analyte</u>	<u>Reporting Limit</u>	<u>MDL</u>
Arsenic	10 mg/Kg	5.0 mg/Kg

Sample results for lead are reported from Furnace analysis for the following Sample No(s).:

88092244, 88092248, 88092254, 88092227.

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001 AAF-S-0035-88

Client: ES Oak Ridge Sample Matrix: Soil

Attn: Bill Hayden Conc. Unit: mg/KG

Address: 710 S. Illinois Avenue Date Received: 9-01-88

Suite F-103 Date Reported: 10-28-88

Oak Ridge, Tn. 37830 Dilution Factor: See Notes

Moisture: 8.9

Project: Duluth ANGB Laboratory Supervisor Approval: *[Signature]*

QC Report for Laboratory Sample No(s):

88092244-88092246, 88092248-88092249

88092252-88092255, 88092223-88092227

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	C1	Duplicate C2	RPD	SA	Spike Recovery SR	SSR	PR	Notes
Arsenic	88092244	88092244	10-11-88	10-4-88	7060	<0.5	<5.0E	<5.0E	NC	4.84	2.42E	6.05	75*	DF=10
Lead	88092244	88092244	10-20-88	10-4-88	7421	<0.5	9.9	11.6	16	6.05	9.9	16.3	106*	DF=NA

2633

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* See Case Narrative attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$ C1 = Concentration One NA = Not Applicable
C2 = Concentration Two NC = Not Calculated
SSR = Spiked Sample Result ND = Not Detected
SR = Sample Result
SA = Spike Added (Concentration)

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

METALS

Job No.: 08001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: ICP-S-0033-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-31-88
Date Reported: 10-28-88
Dilution Factor: NA
%Moisture: 8.1

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88082200-88082203, 88092223-88092227
88092244-88092246, 88092248-88092249
88092252-88092255

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	C1	C2	Duplicate RPD	SA	SR	SSR	PR	Notes
Barium	88082200	88082200	10-20-88	10-18-88	SW6010	<20	55.8	52.6	7	218	55.8	254	91	
Cadmium	88082200	88082200	10-20-88	10-18-88	SW6010	<0.5	7.4	8.7	16	5.4	7.4	11.0	67N	
Chromium	88082200	88082200	10-20-88	10-18-88	SW6010	<1.0	31.8	37.3	16	21.8	31.8	56.7	114	
Lead	88082200	88082200	10-20-88	10-18-88	SW6010	<10	<10	<10	NC	54.4	<10	49.2	90	A

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

A Sample results for lead are reported from furnace analyses for the following
Sample No(s): 88082200-88082203, 88082244, 88092248-88092249, 88092252, 88092255.
B See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$ C1 = Concentration One
C2 = Concentration Two NA = Not Applicable
NC = Not Calculated
ND = Not Detected

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$ SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANCB

QC Report for Laboratory Sample No(s):
88092223-88092227
88092244-88092255

QC Report No: TPH-S-0075-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: NA
Date Prepared: 9-22-88
Date Analyzed: 9-23-88
Date Reported: 11-02-88
Dilution Factor: NA
%Moisture: NA

Laboratory Supervisor Approval:

[Signature]

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
Blank	418.1	<10	8.6J	39.5	38.5	76	37.5	73	3	*

2635

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

J See Legend attached.

* The reporting limit for the sample in this batch is provided by the sub-contract laboratory.

$$\text{Relative Percent Difference (RPD)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{\text{SSR} - \text{SR}}{\text{SA}} \times 100$$

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

SR = Sample Result
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s).: 88082244-88082254

QC Report No: VGC-S-0049-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 9-01-88
Date Prepared: NA
Date Analyzed: 9-13-88
Date Reported: 10-26-88
Dilution Factor: NA
% Moisture: 17.4

Laboratory Supervisor Approval:

[Signature]

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
88082244	Halocarbons: 8010									
	1,1-dichloroethane	12.1	ND	10.6	88	10.1	83	5	20	58-124
	Trichloroethene	12.1	ND	11.5	95	12.2	101	6	16	75-110
	Chlorobenzene	12.1	ND	11.3	93	11.9	98	5	21	71-125
88082244 2636	Aromatics: 8020									
	Benzene	12.1	ND	10.9	90	12.1	100	10	26	75-123
	Toluene	12.1	ND	10.9	90	12.1	100	10	16	79-115
	Chlorobenzene	12.1	ND	10.6	88	11.7	97	10	24	82-112

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

$$\text{Relative Percent Difference (PR)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(\text{MS or MSD}) - \text{SR} \times 100}{\text{SA}}$$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)
NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830

Sample Matrix: Soil
 Conc. Unit: ug/Kg
 Date Reported: 10-26-88

Laboratory Supervisor Approval:

[Signature]

Project: Duluth ANGB

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
52	9-13-88	VGC	Vocol	75-09-2 71-43-2	Dichloromethane Benzene	1.31 1.46	0.25 0.20	88082244-88082250

2637

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO.: OCP-W-0033-88
QC REPORT NO.: OCP-W-0033-88B

Relative percent difference for endrin exceed the EPA guideline in the matrix spike sample. A blank spike analysis shows the laboratory to be in control.

Heptachlor epoxide was inadvertently used instead of heptachlor in the matrix spiking solution.

Endrin aldehyde and Kepone were not recoverable because they were removed by the alumina column clean-up used on these samples.

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No.: OCP-S-0033-88
QC Sample No.: 88082193
Level (Low/Med): Low
Date Reported: 11-02-88

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88082192-88082203
88082244-88082249

[Signature]

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2170	ND	60.7	84	46-127
Heptachlor	2170	ND	57.1	79	35-130
Aldrin	2170	ND	63.0	87	34-132
Dieldrin	5420	ND	182	101	31-134
Endrin	5420	ND	101	56	42-139
4,4'-DDT	5420	ND	202	112	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits	
					RPD	REC
Lindane	64.8	90	84	7	50	46-127
Heptachlor	63.6	88	79	11	31	35-130
Aldrin	66.1	91	87	5	43	34-132
Dieldrin	194	107	101	6	38	31-134
Endrin	175	97	56	54*	45	42-139
4,4'-DDT	210	116	112	4	50	23-134

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: 1 out of 6 outside limits

Spike Recovery: 0 out of 12 outside limits

2639

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No.: OCP-S-0033-88B
QC Sample No.: Blank
Level (Low/Med): Low
Date Reported: 11-02-88

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88082192-88082203
88082244-88082249

[Signature]

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2000	ND	68.4	103	46-127
Heptachlor	2000	ND	65.0	97	35-130
Aldrin	2000	ND	69.3	104	34-132
Dieldrin	5000	ND	200	120	31-134
Endrin	5000	ND	123	74	42-139
4,4'-DDT	5000	ND	157	94	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits	
					RPD	REC
Lindane	65.4	98	103	4	50	46-127
Heptachlor	62.3	94	97	4	31	35-130
Aldrin	69.0	103	104	<1	43	34-132
Dieldrin	193	116	120	4	38	31-134
Endrin	173	103	74	34	45	42-139
4,4'-DDT	152	91	94	3	50	23-134

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: 0 out of 6 outside limits

Spike Recovery: 0 out of 12 outside limits

Job No.: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Lab Name: Engineering Science
Lab Sample No.: Blank
Matrix: Soil
Level (low/med): Low
Extraction-
(SepF/Cont/Sonc): Sonc

Project: Duluth ANGB

Date Extracted: 9-09-88
Date Analyzed (1): 10-05-88
Time Analyzed (1): 11:26
Instrument ID (1): 5890 #2
GC Column ID (1): OV-1

Date Analyzed (2): 10-06-88
Time Analyzed (2): 23:52
Instrument ID (2): 5890 #2
GC Column ID (2): Mixed

This Method Blank applies to the following samples, MS and MSD.

EPA Sample No.	Lab Sample ID (1)	Date Analyzed 1	Lab Sample ID (2)	Date Analyzed 2
-	88082192	10-05-88	83082193	10-07-88
-	88082193	10-05-88	88082197	10-07-88
-	88082194	10-05-88	88082246	10-07-88
-	88082195	10-05-88	88082247	10-07-88
-	88082196	10-05-88		
-	88082197	10-05-88		
-	88082198	10-05-88		
-	88082199	10-05-88		
-	88082200	10-05-88		
-	88082201	10-05-88		
-	88082202	10-05-88		
-	88082203	10-05-88		
-	88082244	10-16-88		
-	88082245	10-16-88		
-	88082246	10-16-88		
-	88082247	10-16-88		
-	88082248	10-16-88		
-	88082249	10-16-88		

METHOD BLANK SUMMARY

Job No:

CR001

Client:

FS Oak Ridge

Attn:

Bill Hayden

Address:

710 S. Illinois Avenue

Suite F-103

Oak Ridge, Tn. 37830

Sample Matrix:

Soil

Conc. Unit:

ug/KG

Date Reported:

12-20-88

Laboratory Supervisor Approval:

J. W. Burton

Project:

Daluth ANGB

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
E5923	10-20-88	BNA	2	-	None Detected	-	-	88082149-88082151 88082192-88082203 88082223-88082227 88092244-88092252
2642								

QUALITY CONTROL RESULTS SUMMARY
EPA METHOD 8270

Job No.: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-1103
Oak Ridge, Tn. 37830

QC Report No: BNA-S-0053-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 9-01-88
Date Prepared: 9-10-88
Date Analyzed: 10-21-88
Date Reported: 12-20-88
Dilution Factor: 1
%Moisture: 17.4

Project: Duluth ANGB
Laboratory Supervisor Approval: *AWB*

QC Report for Laboratory Sample No(s):
88092244-88092252

Fraction	Compound	SA	SR	MS	PR	MSD	PR	RPD	EPA QC Limit RPD %Recovery
B/N Laboratory Sample # 88092244	1,2,4-Trichlorobenzene	4020	ND	2250	56	2410	60	7	23 38-107
	Acenaphthene	4020	ND	2770	69	2690	67	3	19 31-137
	2,4-Dinitrotoluene	4020	ND	3330	83	2970	74	11	47 28-89
	Pyrene	4020	ND	3490	87	3250	81	7	36 35-142
	N-Nitroso-di-n-Propylamine	4020	ND	3900	97	3780	94	3	38 41-126
	1,4-Dichlorobenzene	4020	ND	1370	34	1410	35	3	27 28-104
ACID Laboratory Sample # 88092244	Pentachlorophenol	8030	ND	4860	60	4100	51	16	47 17-109
	Phenol	8030	ND	5660	70	5300	66	6	35 26-90
	2-Chlorophenol	8030	ND	4860	60	4740	59	2	50 25-102
	4-Chloro-3-Methylphenol	8030	ND	7670	95	6950	86	10	33 26-103
	4-Nitrophenol	8030	ND	8270	103	7030	87	17	50 11-114

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

$$\text{Relative Percent Difference (RPD)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(\text{MS or MSD}) - \text{SR} \times 100}{\text{SA}}$$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

PESTICIDE/PCB STANDARDS SUMMARY

Job No.: OR001
 Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830

Instrument ID: 5890 #2
 GC Column ID: OV-1

Date Reported: 11-14-88

Project: Duluth ANGB

Date(s) of Analysis	From: 10-04-88	Date of Analysis:	10-05-88
Time(s) of Analysis	To: 10-06-88	Time of Analysis:	03:28
	From: 11:17	Lab Sample ID:	
	To: 23:10	(Standard)	

Compound	RT	RT Window From To	Calibration Factor	RT	Calibration Factor	QNT Y/N	%D
alpha-BHC	1.37		342833				
beta-BHC	1.47		164292				
delta-BHC	1.66		218617				
gamma-BHC	1.61		312287	1.61	307266	Y	1.6
Heptachlor	2.61		375600	2.60	364517	Y	3.0
Aldrin	3.24		289633	3.23	305050	Y	5.3
Hept. Epoxide	3.97		293033	3.96	302250	Y	3.1
Endosulfan I	4.96		268850	4.95	268033	Y	0.3
Dieldrin	5.81		246350	5.80	246100	Y	0.1
4,4'-DDE	5.87		256233				
Endrin	6.50		244367				
Endosulfan II	6.62		287442	6.61	288842	Y	0.5
4,4'-DDD	7.42		188158				
Endo. Sulfate	8.60		178158				
4,4'-DDT	9.79		201217	9.77	182192	Y	9.5
Methoxychlor	14.85		140958	14.82	135475	Y	3.9
Endrin Ketone	11.06		300750				
a. Chlordane	5.07		307883				
g. Chlordane	4.56		292750				
Toxaphene							
Aroclor-1016							
Aroclor-1221							
Aroclor-1232							
Aroclor-1242							
Aroclor-1248							
Aroclor-1254							
Aroclor-1260							

Under QNT Y/N: enter Y if quantitation was performed, N if not performed.

%D must be less than or equal to 15.0% for quantitation, and less than or equal to 20.0% for confirmation.

Note: Determining that no compounds were found above the CRQL is a form of quantitation, and therefore at least one column must meet the 15.0% criteria.

For multicomponent analysis, the single largest peak that is characteristic of the component should be used to establish retention time and %D. Identification of such analytes is based primarily on pattern recognition.

PESTICIDE/PCB STANDARDS SUMMARY

Job No.: OR001

Instrument ID: 5890 #2

GC Column ID: OV-1

Client: ES Oak Ridge

Attn: Bill Hayden

Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Date Reported: 11-14-88

Project: Duluth ANGB

Date(s) of Analysis	From: 10-04-88 To: 10-06-88	Date of Analysis: 10-05-88 Time of Analysis: 10:52
Time(s) of Analysis	From: 11:17 To: 23:10	Lab Sample ID: (Standard)

Compound	RT	RT Window		Calibration Factor	RT	Calibration Factor	QNT Y/N	%D
		From	To					
alpha-BHC	1.37			342833	1.37	346167	Y	1.0
beta-BHC	1.47			164292	1.47	164455	Y	0.1
delta-BHC	1.66			218617	1.66	219567	Y	0.5
gamma-BHC	1.61			312287				
Heptachlor	2.61			375600				
Aldrin	3.24			289633				
Hept. Epoxide	3.97			293033				
Endosulfan I	4.96			268850				
Dieldrin	5.81			246350				
4,4'-DDE	5.87			256233	5.86	264100	Y	3.1
Endrin	6.50			244367	6.49	243483	Y	0.4
Endosulfan II	6.62			287442				
4,4'-DDD	7.42			188158	7.41	193458	Y	2.8
Endo. Sulfate	8.60			178158	8.58	174408	Y	2.1
4,4'-DDT	9.79			201217				
Methoxychlor	14.85			140958				
Endrin Ketone	11.06			300750	11.04	307406	Y	2.2
a. Chlordane	5.07			307833	5.06	314050	Y	2.0
g. Chlordane	4.56			292733	4.56	299733	Y	2.4
Toxaphene								
Aroclor-1016								
Aroclor-1221								
Aroclor-1232								
Aroclor-1242								
Aroclor-1248								
Aroclor-1254								
Aroclor-1260								

Under QNT Y/N: enter Y if quantitation was performed, N if not performed.

%D must be less than or equal to 15.0% for quantitation, and less than or equal to 20.0% for confirmation.

Note: Determining that no compounds were found above the CRQL is a form of quantitation, and therefore at least one column must meet the 15.0% criteria.

For multicomponent analytes, the single largest peak that is characteristic of the component should be used to establish retention time and %D. Identification of such analytes is based primarily on pattern recognition.

PESTICIDE/PCB STANDARDS SUMMARY

Job No.: OR001
 Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830

Instrument ID: 5890 #2
 GC Column ID: OV-1

Date Reported: 11-14-88

Project: Duluth ANGB

Date(s) of Analysis	From: 10-04-88 To: 10-06-88	Date of Analysis: 10-05-88 Time of Analysis: 18:54
Time(s) of Analysis	From: 11:17 To: 23:10	Lab Sample ID: (Standard)

Compound	RT	RT Window From To	Calibration Factor	RT	Calibration Factor	QNT Y/N	%D
alpha-BHC	1.37		342833				
beta-BHC	1.47		164292				
delta-BHC	1.66		218617				
gamma-BHC	1.61		312287	1.61	312807	Y	0.2
Heptachlor	2.61		375600	2.61	361317	Y	3.8
Aldrin	3.24		289633	3.24	293650	Y	1.4
Hept. Epoxide	3.97		293033	3.97	298517	Y	1.9
Endosulfan I	4.96		268850	4.96	272467	Y	1.3
Dieldrin	5.81		246350	5.82	251367	Y	2.0
4,4'-DDE	5.87		256233				
Endrin	6.50		244367				
Endosulfan II	6.62		287442	6.63	292992	Y	1.9
4,4'-DDD	7.42		188158				
Endo. Sulfate	8.60		178158				
4,4'-DDT	9.79		201217	9.80	186100	Y	7.5
Methoxychlor	14.85		140958	14.85	132362	Y	6.1
Endrin Ketone	11.06		300750				
a. Chlordane	5.07		307883				
g. Chlordane	4.56		292750				
Toxaphene							
Aroclor-1016							
Aroclor-1221							
Aroclor-1232							
Aroclor-1242							
Aroclor-1248							
Aroclor-1254							
Aroclor-1260							

Under QNT Y/N: enter Y if quantitation was performed, N if not performed.

%D must be less than or equal to 15.0% for quantitation, and less than or equal to 20.0% for confirmation.

Note: Determining that no compounds were found above the CRQL is a form of quantitation, and therefore at least one column must meet the 15.0% criteria.

For multicomponent analytes, the single largest peak that is characteristic of the component should be used to establish retention time and %D. Identification of such analytes is based primarily on pattern recognition.

SEMIVOLATILE METHOD BLANK SUMMARY

4B

Job No.:

Work Order No.:

Client:

Lab Sample No.: 03-72

Attn:

Lab File ID: ES923 continued

Address:

Matrix: Soil

Level (low/med):

Date Analyzed: 10-20-88

Time Analyzed: 14:59

Instrument ID:

Date Reported:

Project:

Duluth

This Method Blank applies to the following samples, MS and MSD.

Sample Number	Lab Sample ID	Lab File ID	Date of Analysis
DANGB BG - MW32 - SS1	88092244	ES935	10-21-88
-BG - MW32 - SS1	88092244 MS	ES936	"
-BG - MW32 - SS1	88092244 MSD	ES937	"
-BG - MW32 - SS4	88092245	ES938	"
-SG - C4 - SS2	88092246	ES939	"
-SG - C4 - SS1	88092247	E6363	12-1-88
-SG - E4 - SS1	88092248	E6362	12-1-88
-SG - E4 - SS2	88092249	E6361	11-30-88
-8 - MW14 - SS3	88092250	ES943	10-21-88
-8 - MW14 - SS9	88092251	ES944	"
✓ -8 - MW20 - SS5	88092252	SO203, SO227	10-21-88, 10-24-88

2647

PETROLEUM HYDROCARBONS

Job No.: 0R001
 Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830

QC Report No: TPH-S-0075-88
 Sample Matrix: Soil
 Conc. Unit: mg/KG
 Date Received: NA
 Date Prepared: 9-22-88
 Date Analyzed: 9-23-88
 Date Reported: 11-02-88
 Dilution Factor: NA
 %Moisture: NA

Project: Duluth ANCB

Laboratory Supervisor Approval:

[Signature]

QC Report for Laboratory Sample No(s):
 88092223-88092227
 88092244-88092255

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
Blank	418.1	<10	8.6J	39.5	38.5	76	37.5	73	3	*

2648

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
 J See Legend attached.
 * The reporting limit for the sample in this batch is provided by the sub-contract laboratory.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$
 Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

NA = Not Applicable
 NC = Not Calculated
 ND = Not Detected
 SR = Sample Result
 SA = Spike Added (Concentration)

VOLATILE ORGANICS INITIAL CALIBRATION DATA

LabName: ENGINEERINGSCIENCE Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID.: VOCAL Calibration Date(s): 9/12/88 9/15/88

LAB FILE ID:	RRF10=45,84	RRF20=46,85
RRF 50=47,86	RRF100=48,87	RRF200=49,88

COMPOUND	RRF10	RRF20	RRF50	RRF100	RRF200	RRF	%RSD
Benzyl chloride	5.21	4.65	5.19	4.05	3.70	4.56	14.85
bis (2-chloroethoxy)							
methane	0.09	0.12	0.12	0.14	0.12	0.12	15.16
bis (2-chloroisopropyl							
ether	0.09	0.12	0.12	0.14	0.12	0.12	15.16
Bromobenzene	3.10	3.02	3.45	2.95	2.87	3.08	7.41
Bromodichloromethane	3.09	4.68	2.75	3.72	4.02	3.65	20.84
Bromoform	2.29	3.39	2.11	3.35	3.48	2.92	22.83
Bromomethane	0.70	0.64	0.28	0.29	0.25	0.43	50.34
Carbon tetrachloride	3.51	3.29	3.09	3.46	4.23	3.52	12.28
Chloroacetaldehyde	0.07	0.08	0.08	0.07	0.05	0.07	17.50
Chlorobenzene	0.95	1.25	0.84	1.08	1.25	1.08	17.20
Chloroethane	1.10	1.08	0.63	0.55	0.29	0.73	48.16
Chloroform	4.18	4.22	2.37	3.21	3.62	3.52	21.81
1-Chlorohexane	0.80	0.80	0.94	0.79	0.79	0.82	8.23
2-Chloroethyl vinyl ether	0.09	0.12	0.12	0.14	0.12	0.12	15.16
Chloromethane	2.11	1.21	2.21	1.76	1.90	1.84	21.34
Chloromethyl methyl ether	0.02	0.02	0.03	0.02	0.03	0.02	22.82
o,m,& p_Chlorotoluenes	3.60	3.45	3.67	3.10	2.87	3.34	10.27
Dibromochloromethane	3.35	4.25	2.72	3.82	4.11	3.65	17.17
Dibromomethane	2.95	2.94	3.42	2.95	3.03	3.06	6.76
1,2_Dichlorobenzene	1.62	2.06	1.23	1.71	1.93	1.71	18.74
1,3_Dichlorobenzene	1.34	1.80	1.10	1.49	1.75	1.50	19.47
1,4_Dichlorobenzene	1.48	1.85	1.10	1.44	1.66	1.51	18.47
Dichlorodifluoromethane	0.59	0.77	0.44	0.42	0.49	0.54	26.46
1,1_Dichloroethane	1.92	2.66	1.61	1.94	2.27	2.08	19.20
1,2_Dichloroethane	2.54	3.58	2.20	2.83	3.02	2.83	18.34
1,1_Dichloroethylene	1.64	2.24	1.25	1.56	2.01	1.74	22.30
trans_1,2_dichloroethylene	2.57	2.93	1.76	1.94	2.29	2.30	20.51
Dichloromethane	5.07	4.18	2.02	2.23	2.35	3.17	43.24
1,2_Dichloropropane	2.12	2.97	1.80	2.39	2.61	2.38	18.86
1,3_Dichloropropylene	0.48	0.47	0.54	0.45	0.43	0.47	9.13
1,1,2,2_Tetrachloroethane	3.60	4.47	2.67	3.81	3.85	3.68	17.79
1,1,1,2_Tetrachloroethane	5.32	4.93	5.25	4.40	4.25	4.83	10.12
Tetrachloroethylene	4.04	4.93	3.01	3.49	4.17	3.93	18.52
1,1,1_Trichloroethane	1.98	2.77	1.86	2.08	2.37	2.21	16.59
1,1,2_Trichloroethane	3.91	5.38	5.19	3.91	3.69	4.41	18.16
Trichloroethylene	2.79	3.96	2.44	2.88	3.50	3.11	19.48
Trichlorofluoromethane	1.11	1.30	1.15	0.82	0.97	1.07	17.03
Trichloropropane	3.10	3.02	3.45	2.95	2.87	3.06	7.41
Vinyl chloride	2.11	1.21	2.21	1.76	1.90	1.84	21.34

VOLATILE ORGANICS INITIAL CALIBRATION DATA

LabName:ENGINEERING SCIENCE_____ Contract:_____

Lab Code:_____ Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID.:_VOCOL_ Calibration Date(s):_9/12/88_

LAB FILE ID: RRF 10 _____45_____ RRF 20 _____46_____
RRF 50=_____47_____ RRF100=_____48_____ RRF200=_____49_____

COMPOUND	RRF10	RRF20	RRF50	RRF100	RRF200	RRF	%RSD
Benzene_____	6.77	12.82	3.63	5.56	8.55	7.47	46.71
Chlorobenzene_____	5.81	7.98	6.68	8.42	9.91	7.76	20.46
1,2_Dichlorobenzene_____	9.68	8.95	8.03	6.97	8.10	8.35	12.27
1,3_Dichlorobenzene_____	8.47	10.28	5.95	7.81	9.27	8.36	19.50
1,4_Dichlorobenzene_____	6.05	8.35	4.79	6.34	7.54	6.61	20.81
Ethyl Benzene_____	5.32	6.90	4.16	4.84	6.50	5.54	20.55
Toluene_____	5.81	7.98	4.89	6.12	7.50	6.46	19.61
Xylenes_____	17.90	23.59	14.18	17.64	22.13	19.09	19.80

LATILE CONTINUING CALIBRATION CHECK

Name: _____ Contract: _____

b Code: _____ Case No.: _____ SAS No.: _____

Instrument ID: carbopak _____ Calibration Date(s): 9/12/88

AB FILE ID: 92 _____ Init. Calib. Date(s): 9/2/88 9/10/88

MPFOUND	RRF	RRF50	%D
enzyl chloride	0.08		100.00
s (2-chloroethoxy)			
thane	0.04		100.00
is (2-chloroisopropyl)			
her	0.26		100.00
omobenzene	0.94	1.32	-41.14
omodichloromethane	3.70	3.68	0.53
omoforn	2.59	2.68	-3.59
omomethane	0.38	0.33	14.53
arbon tetrachloride	4.15	4.11	1.08
loroacetaldehyde	ERR		ERR
lorobenzene	1.35	1.34	0.80
loroethane	0.58	0.51	13.14
loroforn	4.32	4.24	1.93
Chlorobenzene	0.89	0.77	13.23
Chloroethyl vinyl ether	0.04		100.00
loromethane	0.49	1.29	-160.18
chloroethyl methyl ether	0.17		100.00
,m, & p, Chlorotoluenes	3.83	5.32	-39.09
ibromochloromethane	4.03	4.62	-14.75
ibromomethane	2.25	2.86	-27.00
2_Dichlorobenzene	2.61	2.47	5.44
3_Dichlorobenzene	2.21	2.14	3.35
,4_Dichlorobenzene	2.07	1.87	9.47
chlorodifluoromethane	0.54		100.00
1_Dichloroethane	2.25	2.30	-2.06
,2_Dichloroethane	2.85	2.85	-0.02
,1_Dichloroethylene	2.77	2.84	-2.65
ans_1,2_dichloroethylene	2.50	2.56	-2.36
chloromethane	1.76	2.79	-58.31
,2_Dichloropropane	2.48	2.39	3.94
3_Dichloropropylene	4.71	4.97	-5.55
,1,2,2_Tetrachloroethane	7.74	8.00	-3.31
,1,1,2_Tetrachloroethane	4.29	6.03	-40.59
trichloroethylene	7.74	8.00	-3.31
,1,1_Trichloroethane	3.06	3.03	0.90
,1,2_Trichloroethane	4.71	4.97	-5.56
trichloropropylene	4.62	4.00	13.49
trichloroethane	2.71	1.66	38.50
trichloroethane	2.86	3.53	-23.64
vinyl chloride	1.43	0.61	57.38

FILE CONTINUING CALIBRATION CHECK

Name: ENGINEERING SCIENCE _____ Contract: _____

Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID.: carbopak Calibration Date(s): 9/12/88 _____

FILE ID: RRF 50 72 _____

Int calib = 9/2/88

FOUND	RRF	RRF50	%D
benzene	6.42	5.55	-13.55
probenzene	4.65	4.20	-9.68
1_Dichlorobenzene	5.49	3.45	-37.16
3_Dichlorobenzene	7.18	3.85	-46.38
4_Dichlorobenzene	4.33	3.05	-29.56
tolyl Benzene	4.57	2.90	-36.54
uene	3.88	3.20	-17.53
enes	21.99	9.30	-57.71

LATILE CONTINUING CALIBRATION CHECK

Name: _____ Contract: _____

Code: _____ Case No.: _____ SAS No.: _____

Instrument ID: carbopa calibration Date(s): 9/13/88 _____

Lab File ID: 89, 90 Int calib 9/11/88, 9/10/88

COMPOUND	RRF	RRF50	%D
benzyl chloride	0.08		100.00
is (2-chloroethoxy)			
ethane	0.04		100.00
is (2-chloroisopropyl)			
ether	0.26		100.00
benzobenzene	0.94	1.13	-20.37
bromodichloromethane	3.70	3.52	5.01
bromoform	2.59	2.60	-0.71
bromomethane	0.38	0.34	10.84
carbon tetrachloride	4.15	3.91	5.86
chloroacetaldehyde	ERR		ERR
chlorobenzene	1.35	1.29	4.56
chloroethane	0.58	0.55	6.07
chloroform	4.32	4.09	5.28
chlorobenzene	0.89	0.93	-4.58
Chloroethyl vinyl ether	0.04		100.00
chloromethane	0.49	1.49	-201.51
chloromethyl methyl ether	0.17		100.00
o,m,p-Chlorotoluenes	3.83	4.21	-10.03
bromochloromethane	4.03	3.80	5.60
ibromomethane	2.25	2.69	-19.71
1,2-Dichlorobenzene	2.61	2.40	8.04
1,3-Dichlorobenzene	2.21	2.06	7.07
1,4-Dichlorobenzene	2.07	1.90	8.29
1-chlorodifluoromethane	0.54		100.00
1,1-Dichloroethane	2.25	2.14	4.85
1,2-Dichloroethane	2.85	2.99	-4.66
1,1-Dichloroethylene	2.77	2.59	6.32
trans-1,2-dichloroethylene	2.50	2.38	4.91
1-chloromethane	1.76	2.53	-43.82
1,2-Dichloropropane	2.48	2.23	10.20
1,3-Dichloropropylene	4.71	5.02	-6.67
1,1,2,2-Tetrachloroethane	7.74	7.67	0.87
1,1,1,2-Tetrachloroethane	4.29	3.78	11.80
tetrachloroethylene	7.74	7.67	0.96
1,1,1-Trichloroethane	3.06	2.85	7.03
1,1,2-Trichloroethane	4.71	5.02	-6.63
Trichlorobenzene	4.62	3.68	15.91
1-chlorodifluoromethane	2.71	1.52	43.81
1-chloropropane	2.86	3.07	-7.33
benzyl chloride	1.43	0.98	31.67

ATILE CONTINUING CALIBRATION CHECK

Name:ENGINEERING SCIENCE_____ Contract:_____

Code:_____ Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID.:carbopak Calibration Date(s):9/13/88 _____

FILE ID: RRF 50 __89_____

Initcal 9/11/88

FOUND	RRF	RRF50	%D
benzene_____	6.42	6.85	6.66
monobenzene_____	4.65	4.83	3.79
2_Dichlorobenzene_____	5.49	5.09	-7.34
3_Dichlorobenzene_____	7.18	12.33	71.67
4_Dichlorobenzene_____	4.33	4.50	3.93
nyl Benzene_____	4.57	3.26	-28.65
luene_____	3.88	3.72	-4.19
enes_____	21.99	20.22	-8.06

DATA PACKAGE #47

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ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Diluth ANGB

Attached are the analytical reports for the water samples received
by this laboratory on 9-9-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88092303	DANGB-8-MW-14-GW-1	BA-I	9-08-88		10-17-88	
88092303	DANGB-8-MW-14-GW-1	CD-F	9-08-88		10-24-88	
88092303	DANGB-8-MW-14-GW-1	CR-F	9-08-88		10-28-88	
88092303	DANGB-8-MW-14-GW-1	PB-F	9-08-88		10-20-88	
88092303	DANGB-8-MW-14-GW-1	418.1	9-08-88	9-28-88	10-05-88	
88092303	DANGB-8-MW-14-GW-1	8010	9-08-88		9-16-88	9-14-88
88092303	DANGB-8-MW-14-GW-1	8020	9-08-88		9-16-88	
88092303	DANGB-8-MW-14-GW-1	8080	9-08-88	9-14-88	10-06-88	
88092304	DANGB-8-MW51-GW-1	BA-I	9-08-88		10-17-88	
88092304	DANGB-8-MW51-GW-1	CD-F	9-08-88		10-21-88	
88092304	DANGB-8-MW51-GW-1	CR-F	9-08-88		10-28-88	
88092304	DANGB-8-MW51-GW-1	PB-F	9-08-88		10-20-88	
88092304	DANGB-8-MW51-GW-1	418.1	9-08-88	9-28-88	10-05-88	
88092304	DANGB-8-MW51-GW-1	8010	9-08-88		9-15-88	9-14-88
88092304	DANGB-8-MW51-GW-1	8020	9-08-88		9-15-88	
88092304	DANGB-8-MW51-GW-1	8080	9-08-88	9-14-88	10-06-88	

* If applicable

**ENGINEERING-SCIENCE, INC.**600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88092305	DANGB-BG-MW42-GW-1	AS-F	9-08-88		11-04-88	
88092305	DANGB-BG-MW42-GW-1	BA-I	9-08-88		10-17-88	
88092305	DANGB-BG-MW42-GW-1	CD-F	9-08-88		10-21-88	
88092305	DANGB-BG-MW42-GW-1	CR-F	9-08-88		10-28-88	
88092305	DANGB-BG-MW42-GW-1	HG-C	9-08-88		9-27-88	
88092305	DANGB-BG-MW42-GW-1	PB-F	9-08-88		10-20-88	
88092305	DANGB-BG-MW42-GW-1	418.1	9-08-88	9-28-88	10-05-88	
88092305	DANGB-BG-MW42-GW-1	8010	9-08-88		9-16-88	9-14-88
88092305	DANGB-BG-MW42-GW-1	8020	9-08-88		9-16-88	
88092305	DANGB-BG-MW42-GW-1	8080	9-08-88	9-14-88	10-06-88	
88092305	DANGB-BG-MW42-GW-1	8270	9-08-88	9-14-88	10-23-88	
88092306	DANGB-BG-MW32-GW-1	AS-F	9-08-88		11-04-88	
88092306	DANGB-BG-MW32-GW-1	BA-I	9-08-88		10-17-88	
88092306	DANGB-BG-MW32-GW-1	CD-F	9-08-88		10-24-88	
88092306	DANGB-BG-MW32-GW-1	CR-F	9-08-88		10-28-88	
88092306	DANGB-BG-MW32-GW-1	HG-C	9-08-88		9-27-88	
88092306	DANGB-BG-MW32-GW-1	PB-F	9-08-88		10-20-88	
88092306	DANGB-BG-MW32-GW-1	418.1	9-08-88	9-28-88	10-05-88	
88092306	DANGB-BG-MW32-GW-1	8010	9-08-88		9-16-88	9-14-88
88092306	DANGB-BG-MW32-GW-1	8020	9-08-88		9-16-88	
88092306	DANGB-BG-MW32-GW-1	8080	9-08-88	9-14-88	10-06-88	
88092306	DANGB-BG-MW32-GW-1	8270	9-08-88	9-14-88	10-23-88	
88092307	DANGB-FB2	8010	9-08-88		9-14-88	9-16-88
88092307	DANGB-FB2	8020	9-08-88		9-14-88	
88092308	DANGB-TB1	8010	9-08-88		9-14-88	9-16-88
88092308	DANGB-TB1	8020	9-08-88		9-14-88	
88092309	DANGB-FB3	8010	9-08-88		9-15-88	9-16-88
88092309	DANGB-FB3	8020	9-08-88		9-15-88	

* If applicable

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88092303-88092309
WORK ORDER NO.: 938

These water samples were received at the ES Berkeley Laboratory on 9-9-88. They were received cold and intact.

ANALYSIS REPORT

ORK ORDER NUMBER: 958
OB NUMBER : ZB0000000440
ORK ORDER DATE : 09/09/88

APPROVED BY


Lab Supervisor

EXPORT DATA:
S OAK RIDGE/DULUTH ANGB
10 S. ILLINOIS AVE. STE. S103
AK RIDGE, TN 37830
ILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

ONTRACT / PO # : OR001
ONTACT : BILL HAYDEN
(615)-481-3920

ASK: 2, UNITS: mg/L

EST COMPOUND	DANGB-8-MW-14- GW-1 88092303	DANGB-8-MW51- GW-1 88092304	DANGB-BG-MW42- GW-1 88092305	DANGB-BG-MW32- GW-1 88092306
CID DIG FLAME	NA	NA	NA	NA
CID DIG FURNACE	NA	NA	NA	NA
ASENIC			<0.005	<0.005
ARIUM	<0.05N	<0.05N	<0.05N	0.12BN
ADMIMUM	<0.001	<0.001	<0.001	<0.001
FROMIUM	0.0024	0.0020	<0.002	0.0026
ERCURY			<.0002	<.0002
EAD	<0.005	<0.005	<0.005	<0.005

) - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 958
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/09/88

APPROVED BY 
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 2, UNITS: mg/L

	DANGB-8-MW-14- GW-1	DANGB-8-MW51- GW-1	DANG-BG-MW42- GW-1	DANGB-BG-MW32- GW-1
TEST COMPOUND	88092303	88092304	88092305	88092306
ACID DIG FLAME	NA	NA	NA	NA
ACID DIG FURNACE	NA	NA	NA	NA
ARSENIC			<0.005	<0.005
BARIUM	<0.05N	<0.05N	<0.05N	0.128N
CADMIUM	<0.001	<0.001	<0.001	<0.001
CHROMIUM	0.0024 B	0.0020B	<0.002	0.0026B
MERCURY			<.0002	<.0002
LEAD	<0.005	<0.005	<0.005	<0.005

NA - Not Analyzed
ND - Not Detected

ANALYSIS REPORT

ORK ORDER NUMBER: 958
OB NUMBER : ZB0000000440
ORK ORDER DATE : 09/09/88

APPROVED BY


Lab Supervisor

EPORT DATA:
S OAK RIDGE/DULUTH ANGB
10 S. ILLINOIS AVE. STE. S103
AK RIDGE, TN 37830
ILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

ONTRACT / PO # : OR001
ONTACT : BILL HAYDEN
(615)-481-3920

ASK: 3, UNITS: mg/L

	DANGB-8-MW-14- GW-1	DANGB-8-MW51- GW-1	DANGB-BG-MW42- GW-1	DANGB-BG-MW32- GW-1
EST COMPOUND	88092303	88092304	88092305	88092306

EST 3 NOT ON FILE			NT	
18.1 PETROLEUM HYDROCARBONS	<1.5	<1.5	<1.5	<1.5

- NOT TESTED
- Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 958
JOB NUMBER : Z80000000440
WORK ORDER DATE : 09/09/88

APPROVED BY

[Signature]
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

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710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/L, GROUP 8010

	DANGB-8-MW-14- GW-1	DANGB-8-MW51- GW-1	DANGB-BG-MW42- GW-1	DANGB-BG-MW32- GW-1	DANGB-FB2	DANGB-TB1
TEST COMPOUND	88092303	88092304	88092305	88092306	88092307	88092308
BENZYL CHLORIDE	ND	ND	ND	ND	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND	ND	ND	ND	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND	ND	ND	ND	ND	ND
BROMOBENZENE	ND	ND	ND	ND	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND	ND	ND	ND
BROMOFORM	ND	ND	ND	ND	ND	ND
BROMOETHANE	ND	ND	ND	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND	ND	ND	ND
CHLORACETALDEHYDE	ND	ND	ND	ND	ND	ND
CHLORAL	ND	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND
CHLOROETHANE	ND	ND	ND	ND	ND	ND
CHLOROFORM	ND	ND	1.0B	ND	13	ND
1-CHLOROHEXANE	ND	ND	ND	ND	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND	ND	ND	ND	ND
CHLOROMETHANE	ND	ND	ND	ND	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND	ND	ND	ND	ND
CHLOROTOLUENE	ND	ND	ND	ND	ND	ND
DIBROMOCHLOROMETHANE	ND	ND	ND	ND	ND	ND
DIBROMOMETHANE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
DICHLOROMETHANE	1.7B	1.3B	0.98B	2.2B	1.2B	1.5B
1,2-DICHLOROPROPANE	ND	ND	ND	ND	ND	ND

ND - Not Detected

PAGE 4

	DANGB-8-MW-14-GW-1	DANGB-8-MW51-GW-1	DANGB-BG-MW42-GW-1	DANGB-BG-MW32-GW-1	DANGB-FB2	DANGB-TB1
TEST COMPOUND	88092303	88092304	88092305	88092306	88092307	88092308

1,3-DICHLOROPROPYLENE	ND	ND	ND	ND	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1,1,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
TETRACHLOROETHYLENE	ND	ND	ND	ND	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
TRICHLOROFLUOROMETHANE	ND	ND	ND	ND	ND	ND
TRICHLOROPROPANE	ND	ND	ND	ND	ND	ND
VINYL CHLORIDE	ND	ND	ND	ND	ND	ND

1 - Not Detected

2364

12/22/88

ANALYSIS REPORT FOR WORK ORDER NUMBER 958

TASK: 4, UNITS: ug/L, GROUP 8010

DANGB-FB3

TEST COMPOUND 88092309

BENZYL CHLORIDE	ND
BIS (2-CHLOROETHOXY)METHANE	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND
BROMOBENZENE	ND
BROMODICHLOROMETHANE	ND
BROMOFORM	ND
BROMOETHANE	ND
CARBON TETRACHLORIDE	ND
CHLORACETALDEHYDE	ND
CHLORAL	ND
CHLOROBENZENE	ND
CHLOROETHANE	ND
CHLOROFORM	15
1-CHLOROHEXANE	ND
2-CHLOROETHYL VINYL ETHER	ND
CHLOROMETHANE	ND
CHLOROMETHYL METHYL ETHER	ND
CHLOROTOLUENE	ND
DIBROMOCHLOROMETHANE	ND
DIBROMOMETHANE	ND
1,2-DICHLOROBENZENE	ND
1,3-DICHLOROBENZENE	ND
1,4-DICHLOROBENZENE	ND
DICHLORODIFLUOROMETHANE	ND
1,1-DICHLOROETHANE	ND
1,2-DICHLOROETHANE	ND
1,1-DICHLOROETHYLENE	ND
TRANS-1,2-DICHLOROETHYLENE	ND
DICHLOROMETHANE	1.5B
1,2-DICHLOROPROPANE	ND
1,3-DICHLOROPROPYLENE	ND
1,1,2,2-TETRACHLOROETHANE	ND
1,1,1,2-TETRACHLOROETHANE	ND
TETRACHLOROETHYLENE	ND
1,1,1-TRICHLOROETHANE	ND
1,1,2-TRICHLOROETHANE	ND
TRICHLOROETHYLENE	ND
TRICHLOROFLUOROMETHANE	ND
TRICHLOROPROPANE	ND
VINYL CHLORIDE	ND

ND - Not Detected

ANALYSIS REPORT

ORK ORDER NUMBER: 958
OB NUMBER : ZB0000000440
ORK ORDER DATE : 09/09/88

APPROVED BY

Lab Supervisor

EXPORT DATA:
S OAK RIDGE/DULUTH ANGB
10 S. ILLINOIS AVE. STE. S103
AK RIDGE, TN 37830
ILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

ONTRACT / PO # : OR001
ONTACT : BILL HAYDEN
(615)-481-3920

ASK: 4, UNITS: ug/L, GROUP 8020

	DANGB-8-MW-14- GW-1	DANGB-8-MW51- GW-1	DANGB-BG-MW42- GW-1	DANGB-BG-MW32- GW-1	DANGB-FB2	DANGB-TB1
EST COMPOUND	88092303	88092304	88092305	88092306	88092307	88092308
ENZENE	ND	ND	ND	ND	ND	ND
HLOROBENZENE	ND	ND	ND	ND	ND	ND
,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
THYL BENZENE	ND	ND	ND	ND	ND	ND
OLUENE	ND	ND	ND	ND	ND	ND
YLENES	ND	ND	ND	ND	ND	ND

) - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 958

TASK: 4, UNITS: ug/L, GROUP 8020

DANGB-FB3

TEST COMPOUND 88092309

BENZENE	ND
CHLOROBENZENE	ND
1,2-DICHLOROBENZENE	ND
1,3-DICHLOROBENZENE	ND
1,4-DICHLOROBENZENE	ND
ETHYL BENZENE	ND
TOLUENE	ND
XYLENES	ND

ND - Not Detected

12/22/88

ANALYSIS REPORT

ORK ORDER NUMBER: 958
 JB NUMBER : Z80000000440
 ORK ORDER DATE : 09/09/88

APPROVED BY

Lab Supervisor

REPORT DATA:
 S OAK RIDGE/DULUTH ANGB
 IO S. ILLINOIS AVE. STE. S103
 K RIDGE, TN 37830
 ILL HAYDEN

CLIENT DATA:
 ES OAK RIDGE/DULUTH ANGB (134)
 710 S. ILLINOIS AVE. STE. S103
 OAK RIDGE, TN 37830

OF REPORT COPIES: 1

ONTRACT / PO # : OR001
 ONTACT : BILL HAYDEN
 (615)-481-3920

ASK: 4, UNITS: ug/L, GROUP 8080

EST COMPOUND	DANGB-8-MW-14- GW-1 88092303	DANGB-8-MW51- GW-1 88092304	DANGB-BG-MW42- GW-1 88092305	DANGB-BG-MW32- GW-1 88092306
DRIN	ND	ND	ND	ND
PHA-BHC	ND	ND	ND	ND
ETA-BHC	ND	ND	ND	ND
ELTA-BHC	ND	ND	ND	ND
AMMA-BHC	ND	ND	ND	ND
HLORDANE	ND	ND	ND	ND
,4'-DDD	ND	ND	ND	ND
,4'-DDE	ND	ND	ND	ND
,4'-DDT	ND	ND	ND	ND
EELDRIN	ND	ND	ND	ND
IDOSULFAN I	ND	ND	ND	ND
IDOSULFAN II	ND	ND	ND	ND
IDOSULFAN SULFATE	ND	ND	ND	ND
IDRIN	ND	ND	ND	ND
IDRIN ALDEHYDE	NA	NA	NA	NA
EPTACHLOR	ND	ND	ND	ND
EPTACHLOR EPOXIDE	ND	ND	ND	ND
EPONE	ND	ND	ND	ND
ETHOXYCHLOR	ND	ND	ND	ND
OXAPHENE	ND	ND	ND	ND
CB-1016	ND	ND	ND	ND
CB-1221	ND	ND	ND	ND
CB-1232	ND	ND	ND	ND
CB-1242	ND	ND	ND	ND
CB-1248	ND	ND	ND	ND
CB-1254	ND	ND	ND	ND
CB-1260	ND	ND	ND	ND

1- NOT ANALYZED
 - Not Detected

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Water

page 1 of 5

Date Received: September 9, 1988
Date Reported: December 8, 1988

Work Order: 958
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082305	88082306
Sample No.:	DANGB-BG-MW42-GW1	DANGB-BG-MW32-GW1
Date Sampled:	09-08-88	09-08-88
Time Sampled:	08:45	11:00
Date Extracted:	09-14-88	09-14-88
Date Analyzed:	10-23-88	10-23-88

Compound	Detection Limits ug/L	ANALYTICAL RESULTS	
		ug/L	ug/L
1,3-Dichlorobenzene	10	ND	ND
1,4-Dichlorobenzene	10	ND	ND
Hexachloroethane	10	ND	ND
Bis(2-chloroethyl)ether	10	ND	ND
1,2-Dichlorobenzene	10	ND	ND
N-Nitrosodimethylamine	10	ND	ND
Bis(2-chloroisopropyl)ether	10	ND	ND
N-Nitrosodi-n-propylamine	10	ND	ND
Hexachlorobutadiene	10	ND	ND
1,2,4-Trichlorobenzene	10	ND	ND
Nitrobenzene	10	ND	ND
Isophorone	10	ND	ND
Naphthalene	10	ND	ND
Bis(2-chloroethoxy)methane	10	ND	ND
1-Chloronaphthalene	10	ND	ND
Hexachlorocyclopentadiene	10	ND	ND
Acenaphthylene	10	ND	ND
Acenaphthene	10	ND	ND
Dimethyl phthalate	10	ND	ND
2,6-Dinitrotoluene	10	ND	ND
Fluorene	10	ND	ND
2,4-Dinitrotoluene	10	ND	ND
Diethyl phthalate	10	ND	ND
N-Nitrosodiphenylamine	10	ND	ND
Hexachlorobenzene	10	ND	ND

B = Compound was detected in the blank.

Base Neutrals - SW 8270
Matrix: Water
(continued)

Date Received: September 9, 1988
Date Reported: December 8, 1988

Work Order: 958
Job Number: OR001

From: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082305	88082306
Sample No.:	DANGB-BG-MW42-GW1	DANGB-BG-MW32-GW1
Date Sampled:	09-08-88	09-08-88
Time Sampled:	08:45	11:00
Date Extracted:	09-14-88	09-14-88
Date Analyzed:	10-23-88	10-23-88

Compound	Detection Limits ug/L	ANALYTICAL RESULTS	
		ug/L	ug/L
Benanthrene	10	ND	ND
Anthracene	10	ND	ND
Di-n-butyl phthalate	10	ND	ND
Fluoranthene	10	ND	ND
1-Chlorophenyl phenyl ether	10	ND	ND
Pyrene	10	ND	ND
Di-n-butyl Benzyl phthalate	10	ND	ND
Diis(2-ethylhexyl) phthalate	10	10 B	ND
Acrysenes	10	ND	ND
1-Bromophenyl phenyl ether	10	ND	ND
Benzo(a)anthracene	10	ND	ND
Di-n-octylphthalate	10	ND	ND
Benzo(b)fluoranthene	10	ND	ND
Benzo(k)fluoranthene	10	ND	ND
Benzenidine	60	ND	ND
1,3'-Dichlorobenzidine	20	ND	ND
Benzo(a)pyrene	10	ND	ND
Benzo(1,2,3-cd)pyrene	10	ND	ND
Benzo(a,h)anthracene	10	ND	ND
Benzo(ghi)perylene	10	ND	ND
Allyl Alcohol	20	ND	ND

= Compound was detected in the blank.

Matrix: Water

(continued)

Date Received: September 9, 1988

Work Order: 958

Date Reported: December 8, 1988

Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB

ATTN: Mr. Bill Hayden

Address: 710 S. Illinois Avenue Suite F-103

Oak Ridge, Tennessee 37830

Lab Number:	88082305	88082306
Sample No.:	DANGB-BG-MW42-GW1	DANGB-BG-MW32-GW1
Date Sampled:	09-08-88	09-08-88
Time Sampled:	08:45	11:00
Date Extracted:	09-14-88	09-14-88
Date Analyzed:	10-23-88	10-23-88

Compound	Detection	Analytical Results	
	Limits	ug/L	ug/L
	ug/L		
Acetophenone	--*	ND	ND
Aniline	--*	ND	ND
4-Aminobiphenyl	--*	ND	ND
4-Chloroaniline	20	ND	ND
1-Chloronaphthalene	--*	ND	ND
Dibenzofuran	10	ND	ND
p-Dimethylaminoazobenzene	--*	ND	ND
7,12-Dimethylbenz(a)anthracene	--*	ND	ND
a-,a-Dimethylphenethylamine	--*	ND	ND
Diphenylamine	--*	ND	ND
1,2-Diphenylhydrazine	--*	ND	ND
Ethyl methanesulfonate	--*	ND	ND
3-Methylcholanthrene	--*	ND	ND
Methyl methanesulfonate	--*	ND	ND
2-Methylnaphthalene	10	ND	ND
1-Naphthylamine	--*	ND	ND
2-Naphthylamine	--*	ND	ND
2-Nitroaniline	50	ND	ND
3-Nitroaniline	50	ND	ND
4-Nitroaniline	50	ND	ND
N-Nitroso-di-n-butylamine	--*	ND	ND
N-Nitrosopiperidine	--*	ND	ND
Pentachlorobenzene	--*	ND	ND
Pentachloronitrobenzene	--*	ND	ND
Phenacetin	--*	ND	ND
2-Picoline	--*	ND	ND
Pronamide	--*	ND	ND
1,2,4,5-Tetrachlorobenzene	--*	ND	ND

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

Pesticides and PCBs - SW 8270
Matrix: Water

ate Received: September 9, 1988
ate Reported: December 8, 1988

Work Order: 958
Job Number: OR001

DR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN:Mr. Bill Hayden

ab Number:	88082305	88082306
ample No.:	DANGB-BG-MW42-GW1	DANGB-BG-MW32-GW1
ate Sampled:	09-08-88	09-08-88
ime Sampled:	08:45	11:00
ate Extracted:	09-14-88	09-14-88
ate Analyzed:	10-23-88	10-23-88

Compound	Detection Limits ug/L	ANALYTICAL RESULTS	
		ug/L	ug/L
alpha-BHC	--*	ND	ND
gamma-BHC	---	ND	ND
delta-BHC	20	ND	ND
gamma-chlor	10	ND	ND
delta-BHC	15	ND	ND
ldrin	10	ND	ND
gamma-chlor epoxide	10	ND	ND
ndosulfan I	--*	ND	ND
ieldrin	15	ND	ND
,4'-DDE	30	ND	ND
ndrin	--*	ND	ND
ndosulfan II	--*	ND	ND
,4'-DDD	15	ND	ND
,4'-DDT	25	ND	ND
ndosulfan Sulfate	30	ND	ND
ndrin aldehyde	--*	ND	ND
ndrin Ketone	--*	ND	ND
nlordane	60	ND	ND
ethoxychlor	--*	ND	ND
oxaphene	60	ND	ND
roclor-1016	60	ND	ND
roclor-1221	60	ND	ND
roclor-1232	60	ND	ND
roclor-1242	60	ND	ND
roclor-1248	60	ND	ND
roclor-1254	60	ND	ND
roclor-1260	60	ND	ND

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

Acid Extractables -- SW 8270
Matrix: Water

Date Received: September 9, 1988
Date Reported: December 8, 1988

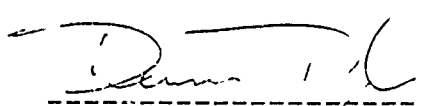
Work Order: 958
Job Number: OR001


FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082305	88082306
Sample No.:	DANGB-BG-MW42-GW1	DANGB-BG-MW32-GW1
Date Sampled:	09-08-88	09-08-88
Time Sampled:	08:45	11:00
Date Extracted:	09-14-88	09-14-88
Date Analyzed:	10-23-88	10-23-88

Compound	Detection Limits ug/L	ANALYTICAL RESULTS	
		ug/L	ug/L
2-Chlorophenol	10	ND	ND
2-Nitrophenol	10	ND	ND
Phenol	10	ND	ND
2,4-Dimethylphenol	10	ND	ND
2,4-Dichlorophenol	10	ND	ND
2,4,5-Trichlorophenol	10	ND	ND
4-Chloro-3-methylphenol	20	ND	ND
2,4-Dinitrophenol	50	ND	ND
2,6-Dichlorophenol	--*	ND	ND
4-Methyl-4,6-Dinitrophenol	50	ND	ND
Pentachlorophenol	50	ND	ND
1-Nitrophenol	50	ND	ND
Benzoic Acid	50	ND	ND
2-Methylphenol	10	ND	ND
3- & 4-Methylphenol	10	ND	ND
2,3,4,6-Tetrachlorophenol	--*	ND	ND
2,4,5-Trichlorophenol	10	ND	ND


Analyst


Laboratory Supervisor

* EPA has not yet determined detection limits for these compounds.

-- = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

CHAIN OF CUSTODY RECORD

2674

CHAIN OF CUSTODY RECORD

2675

CHAIN OF CUSTODY RECORD

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3678

NO.	PROJECT NAME/LOCATION	WATER ANALYSES REQUIRED	SHIP TO:
NO.		NO	

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City Oak Ridge		State TN	
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YOUR BILLING REFERENCE INFORMATION (FIRST 24 CHARACTERS WILL APPEAR ON INVOICE)			
3			
DELIVERY AND SPECIAL HANDLING			
1 <input type="checkbox"/> HOLD FOR PICK-UP (See Note 19)			
2 <input type="checkbox"/> DELIVER WEEKDAY			
3 <input type="checkbox"/> DELIVER SATURDAY (See Note 19)			
4 <input type="checkbox"/> DELIVER MONDAY			
5 <input type="checkbox"/> DELIVER TUESDAY			
6 <input type="checkbox"/> DELIVER WEDNESDAY			
7 <input type="checkbox"/> DELIVER THURSDAY			
8 <input type="checkbox"/> DELIVER FRIDAY			
9 <input type="checkbox"/> DELIVER SATURDAY			
10 <input type="checkbox"/> DELIVER SUNDAY			
11 <input type="checkbox"/> DELIVER MONDAY			
12 <input type="checkbox"/> DELIVER TUESDAY			
13 <input type="checkbox"/> DELIVER WEDNESDAY			
14 <input type="checkbox"/> DELIVER THURSDAY			
15 <input type="checkbox"/> DELIVER FRIDAY			
16 <input type="checkbox"/> DELIVER SATURDAY			
17 <input type="checkbox"/> DELIVER SUNDAY			
18 <input type="checkbox"/> DELIVER MONDAY			
19 <input type="checkbox"/> DELIVER TUESDAY			
20 <input type="checkbox"/> DELIVER WEDNESDAY			
21 <input type="checkbox"/> DELIVER THURSDAY			
22 <input type="checkbox"/> DELIVER FRIDAY			
23 <input type="checkbox"/> DELIVER SATURDAY			
24 <input type="checkbox"/> DELIVER SUNDAY			
25 <input type="checkbox"/> DELIVER MONDAY			
26 <input type="checkbox"/> DELIVER TUESDAY			
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**FEDERAL
EXPRESS**

SEE THIS AIRBILL FOR DOMESTIC SHIPMENTS
SEE THE INTERNATIONAL AIR MAIL FOR SHIPMENTS TO PORTS IN
QUESTIONS CALL 800-236-5333 TOLL FREE

AIRBILL

**PACKAGE
TRACKING NUMBER**

9490314245

Sender's Federal Express Account Number

1196-4207-B

From (Your Name) Please Print

Karl Davis

Your Phone Number (Very Important)

(615) 491-3423

Company

Fine Arts Source

Street Address

710 S. Tenth

City

Dallas

State

TX

ZIP

75203

To (Recipient's Name) Please Print

Karl Davis

Company

Fine Arts Source

Exact Street Address (For Express Address or P.O. or Zip Code)

600 Broadway

City

Beaumont

State

TX

ZIP

77705

Recipient's Phone Number (Very Important)

(415) 545-7920

Department/Floor No.

1st Floor

Department/Floor No.

1st Floor

State

TX

ZIP

77705

SENDER'S COPY

YOUR BILLING REFERENCE INFORMATION (FIRST 24 CHARACTERS WILL APPEAR ON INVOICE)

3-202-2

PAYMENT ☐ Bill Sender ☐ Bill Recipient's FedEx Account No. ☐ Bill Credit Card

SERVICES

1 ☒ **PRIORITY 1** Overnight Delivery

2 ☐ **COURIER-PAX** 7 ☐ **OVERNIGHT ENVELOPE**

3 ☐ **OVERNIGHT** 8 ☐ **BOX**

4 ☐ **OVERNIGHT** 9 ☐ **TUBE**

5 ☐ **STANDARD** 10 ☐ **ALL DAY**

11 ☐ **DELIVERY** not later than second business day

12 ☐ **DECLARED VALUE** Limit \$100

DELIVERY AND SPECIAL HANDLING

1 ☐ **HOLD FOR PICK-UP** (To be used by customer)

2 ☒ **DELIVER SATURDAY** (Extra charge)

3 ☐ **DELIVER SUNDAY** (Extra charge)

4 ☐ **DELIVER MONDAY** (Extra charge)

5 ☐ **DELIVER TUESDAY** (Extra charge)

6 ☐ **DELIVER WEDNESDAY** (Extra charge)

7 ☐ **DELIVER THURSDAY** (Extra charge)

8 ☐ **DELIVER FRIDAY** (Extra charge)

9 ☐ **DELIVER SATURDAY** (Extra charge)

10 ☐ **DELIVER SUNDAY** (Extra charge)

11 ☐ **DELIVER MONDAY** (Extra charge)

12 ☐ **DELIVER TUESDAY** (Extra charge)

SERVICE CONDITIONS, DECLARED VALUE AND LIMIT OF LIABILITY

Use of this label constitutes your agreement to the service conditions in our current Service Guide which is available upon request. See back of sender's copy of the label for further information.

We will not be responsible for any claim in excess of \$100 per package, whether the result of loss, damage, delay or non-delivery, unless you specify a higher amount in the space to the left, pay 40¢ per additional \$100 specified and document your actual loss in the event of a claim. See our current Service Guide for details.

Federal Express is not responsible for loss of or damage to contents of packages for loss of the intrinsic value of the package, as well as for loss of sales, income, interest, profit, attorneys fees, costs and any other form of damage, whether direct, incidental, consequential or special, in excess of the declared value of the package.

In the event of a claim, your recovery shall not exceed your actual loss.

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**FEDERAL
EXPRESS**

AIRBILL

USE THIS AIRBILL FOR DOMESTIC SHIPMENTS WITHIN THE CONTINENTAL U.S.A., ALASKA AND HAWAII.
USE THE INTERNATIONAL AIR WAYBILL FOR SHIPMENTS TO PORTS IN C. QUESTION? CALL 800-330-3333 TOLL FREE.

**PACKAGE
TRACKING NUMBER**

9490314282

9490314282

Sender's Federal Express Account Number 9490314282		Date 9/1/81	
From (Your Name) Please Print FEDERAL EXPRESS		Your Phone Number (Very Important) () 000 0000	
Company FEDERAL EXPRESS		Department/Floor/No. 100	
Street Address FEDERAL EXPRESS		Exact Street Address (We Cannot Deliver to P.O. Boxes or Zip Codes.) FEDERAL EXPRESS	
City FEDERAL		City FEDERAL	
State FL		State FL	
ZIP Required 33000		ZIP Required 33000	
YOUR BILLING REFERENCE INFORMATION (FIRST 24 CHARACTERS WILL APPEAR ON INVOICE) 9490314282			
IF HOLD FOR PICK-UP, Print FEDEX Address Here Street Address City State ZIP Required			
PAYMENT <input type="checkbox"/> Bill Sender <input type="checkbox"/> Bill Recipient's FedEx Acct. No. <input type="checkbox"/> Bill 3rd Party FedEx Acct. No. <input type="checkbox"/> Bill Credit Card <input type="checkbox"/> Cash			
4 SERVICES			
DELIVERY AND SPECIAL HANDLING			
1 <input type="checkbox"/> PRIORITY 1 <input type="checkbox"/> Overnight Delivery <input type="checkbox"/> OVERNIGHT LETTER*			
2 <input type="checkbox"/> COURIER-PAR <input type="checkbox"/> Overnight Envelopes <input type="checkbox"/> DELIVER WEEKDAY			
3 <input type="checkbox"/> OVERNIGHT <input type="checkbox"/> BOX <input type="checkbox"/> DELIVER SATURDAY <input type="checkbox"/> DELIVER WEEKDAY			
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AIRBILL

PACKAGE TRACKING NUMBER

9490314221

SENDER'S COPY

Sender's Federal Express Account Number 1144 - 4207-8		Date 9/1/88	
From (Your Name) Please Print F. M. - 1700-1		To (Recipient's Name) Please Print AMERICAN AIRLINES	
Company AMERICAN AIRLINES		Company AMERICAN AIRLINES	
Street Address 1700-1		Exact Street Address (We Cannot Deliver to P.O. Boxes or R.F.D. Zip Codes) 1700-1	
City Dayton		City Dayton	
State OH		State OH	
ZIP Required 45424		ZIP Required 45424	

YOUR BILLING REFERENCE INFORMATION (FIRST 24 CHARACTERS WILL APPEAR ON INVOICE)

PAYMENT ☐ Bill Sender ☐ Bill Recipient's FedEx Acct. No. ☐ Bill Credit Card

SERVICES		DELIVERY AND SPECIAL HANDLING		PACKAGES		ITEMS		TIME DELIVERY (See Note)		DECL. VALUE		FEDERAL EXPRESS USE	
1 <input type="checkbox"/> PRIORITY 1	6 <input type="checkbox"/> OVERNIGHT LETTER*	1 <input type="checkbox"/> HOLD FOR PICK-UP	2 <input type="checkbox"/> DELIVER WEEKDAY	1 <input type="checkbox"/> PARCEL	1 <input type="checkbox"/> RETAIL	1 <input type="checkbox"/> REGULAR STOP	1 <input type="checkbox"/> ON-CALL STOP	1 <input type="checkbox"/> REGULAR STOP	1 <input type="checkbox"/> ON-CALL STOP	1 <input type="checkbox"/> DECLARED VALUE	1 <input type="checkbox"/> DECLARED VALUE	1 <input type="checkbox"/> DECLARED VALUE	1 <input type="checkbox"/> DECLARED VALUE
2 <input type="checkbox"/> COUNTER-FAX	7 <input type="checkbox"/> OVERNIGHT ENVELOPE*	3 <input type="checkbox"/> DELIVER SATURDAY	3 <input type="checkbox"/> DELIVER SATURDAY	2 <input type="checkbox"/> PARCEL	2 <input type="checkbox"/> RETAIL	2 <input type="checkbox"/> REGULAR STOP	2 <input type="checkbox"/> ON-CALL STOP	2 <input type="checkbox"/> REGULAR STOP	2 <input type="checkbox"/> ON-CALL STOP	2 <input type="checkbox"/> DECLARED VALUE	2 <input type="checkbox"/> DECLARED VALUE	2 <input type="checkbox"/> DECLARED VALUE	2 <input type="checkbox"/> DECLARED VALUE
3 <input type="checkbox"/> OVERNIGHT BOX	8 <input type="checkbox"/> OVERNIGHT	4 <input type="checkbox"/> BANKING COORS	4 <input type="checkbox"/> BANKING COORS	3 <input type="checkbox"/> PARCEL	3 <input type="checkbox"/> RETAIL	3 <input type="checkbox"/> REGULAR STOP	3 <input type="checkbox"/> ON-CALL STOP	3 <input type="checkbox"/> REGULAR STOP	3 <input type="checkbox"/> ON-CALL STOP	3 <input type="checkbox"/> DECLARED VALUE	3 <input type="checkbox"/> DECLARED VALUE	3 <input type="checkbox"/> DECLARED VALUE	3 <input type="checkbox"/> DECLARED VALUE
4 <input type="checkbox"/> OVERNIGHT TUBE	9 <input type="checkbox"/> OVERNIGHT	5 <input type="checkbox"/> CONSTANT SURVEILLANCE SERVICE (CSS)	5 <input type="checkbox"/> CONSTANT SURVEILLANCE SERVICE (CSS)	4 <input type="checkbox"/> PARCEL	4 <input type="checkbox"/> RETAIL	4 <input type="checkbox"/> REGULAR STOP	4 <input type="checkbox"/> ON-CALL STOP	4 <input type="checkbox"/> REGULAR STOP	4 <input type="checkbox"/> ON-CALL STOP	4 <input type="checkbox"/> DECLARED VALUE	4 <input type="checkbox"/> DECLARED VALUE	4 <input type="checkbox"/> DECLARED VALUE	4 <input type="checkbox"/> DECLARED VALUE
5 <input type="checkbox"/> STANDARD AIR Delivery not later than second business day	10 <input type="checkbox"/> STANDARD	6 <input type="checkbox"/> DAYTIME SIGNATURE SERVICE	6 <input type="checkbox"/> DAYTIME SIGNATURE SERVICE	5 <input type="checkbox"/> PARCEL	5 <input type="checkbox"/> RETAIL	5 <input type="checkbox"/> REGULAR STOP	5 <input type="checkbox"/> ON-CALL STOP	5 <input type="checkbox"/> REGULAR STOP	5 <input type="checkbox"/> ON-CALL STOP	5 <input type="checkbox"/> DECLARED VALUE	5 <input type="checkbox"/> DECLARED VALUE	5 <input type="checkbox"/> DECLARED VALUE	5 <input type="checkbox"/> DECLARED VALUE
		7 <input type="checkbox"/> OTHER SPECIAL SERVICE	7 <input type="checkbox"/> OTHER SPECIAL SERVICE	6 <input type="checkbox"/> PARCEL	6 <input type="checkbox"/> RETAIL	6 <input type="checkbox"/> REGULAR STOP	6 <input type="checkbox"/> ON-CALL STOP	6 <input type="checkbox"/> REGULAR STOP	6 <input type="checkbox"/> ON-CALL STOP	6 <input type="checkbox"/> DECLARED VALUE	6 <input type="checkbox"/> DECLARED VALUE	6 <input type="checkbox"/> DECLARED VALUE	6 <input type="checkbox"/> DECLARED VALUE
		8 <input type="checkbox"/> SATURDAY PICK-UP	8 <input type="checkbox"/> SATURDAY PICK-UP	7 <input type="checkbox"/> PARCEL	7 <input type="checkbox"/> RETAIL	7 <input type="checkbox"/> REGULAR STOP	7 <input type="checkbox"/> ON-CALL STOP	7 <input type="checkbox"/> REGULAR STOP	7 <input type="checkbox"/> ON-CALL STOP	7 <input type="checkbox"/> DECLARED VALUE	7 <input type="checkbox"/> DECLARED VALUE	7 <input type="checkbox"/> DECLARED VALUE	7 <input type="checkbox"/> DECLARED VALUE
		9 <input type="checkbox"/> SATURDAY DELIVERY	9 <input type="checkbox"/> SATURDAY DELIVERY	8 <input type="checkbox"/> PARCEL	8 <input type="checkbox"/> RETAIL	8 <input type="checkbox"/> REGULAR STOP	8 <input type="checkbox"/> ON-CALL STOP	8 <input type="checkbox"/> REGULAR STOP	8 <input type="checkbox"/> ON-CALL STOP	8 <input type="checkbox"/> DECLARED VALUE	8 <input type="checkbox"/> DECLARED VALUE	8 <input type="checkbox"/> DECLARED VALUE	8 <input type="checkbox"/> DECLARED VALUE
		10 <input type="checkbox"/> SATURDAY DELIVERY	10 <input type="checkbox"/> SATURDAY DELIVERY	9 <input type="checkbox"/> PARCEL	9 <input type="checkbox"/> RETAIL	9 <input type="checkbox"/> REGULAR STOP	9 <input type="checkbox"/> ON-CALL STOP	9 <input type="checkbox"/> REGULAR STOP	9 <input type="checkbox"/> ON-CALL STOP	9 <input type="checkbox"/> DECLARED VALUE	9 <input type="checkbox"/> DECLARED VALUE	9 <input type="checkbox"/> DECLARED VALUE	9 <input type="checkbox"/> DECLARED VALUE
		11 <input type="checkbox"/> SATURDAY DELIVERY	11 <input type="checkbox"/> SATURDAY DELIVERY	10 <input type="checkbox"/> PARCEL	10 <input type="checkbox"/> RETAIL	10 <input type="checkbox"/> REGULAR STOP	10 <input type="checkbox"/> ON-CALL STOP	10 <input type="checkbox"/> REGULAR STOP	10 <input type="checkbox"/> ON-CALL STOP	10 <input type="checkbox"/> DECLARED VALUE	10 <input type="checkbox"/> DECLARED VALUE	10 <input type="checkbox"/> DECLARED VALUE	10 <input type="checkbox"/> DECLARED VALUE
		12 <input type="checkbox"/> SATURDAY DELIVERY	12 <input type="checkbox"/> SATURDAY DELIVERY	11 <input type="checkbox"/> PARCEL	11 <input type="checkbox"/> RETAIL	11 <input type="checkbox"/> REGULAR STOP	11 <input type="checkbox"/> ON-CALL STOP	11 <input type="checkbox"/> REGULAR STOP	11 <input type="checkbox"/> ON-CALL STOP	11 <input type="checkbox"/> DECLARED VALUE	11 <input type="checkbox"/> DECLARED VALUE	11 <input type="checkbox"/> DECLARED VALUE	11 <input type="checkbox"/> DECLARED VALUE

009

PART 720417-38300
REVENUE DATE 7/88
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QUALITY CONTROL RESULTS SUMMARY METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: AAF-W-0032-88
Sample Matrix: Water
Conc. Unit: ug/l
Date Received: 9-01-88
Date Reported: 11-07-88
Dilution Factor: HA

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88092256, 88092303-88092306, 88092291-88092293
88092312-88092316, 88092321-88092327

Laboratory Supervisor Approval:

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	C1	Duplicate C2	RPD	SA	Spike Recovery SR	SSR	PR	Notes
Arsenic	88092256	88092256	11-04-88	10-11-88	7060	<0.010	<0.005	<0.005	HC	0.040	<0.005	0.0410	102	
Cadmium	88092256	88092256	10-26-88	10-11-88	7131	<0.005	<0.001	<0.001	NC	5.0	<0.001	5.26	105	
Chromium	88092256	88092256	10-28-88	10-11-88	6010	<0.005	<0.002	<0.002	HC	20.0	<0.002	20.07	100	
Lead	88092256	88092256	10-20-88	10-11-88	7421	<0.010	<0.005	<0.005	HC	0.020	<0.005	0.0229	114	

$$\text{Relative Percent Difference (RPD)} = \frac{C1 - C2}{(C1 + C2)/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{SSR - SR}{SA} \times 100$$

C1 = Concentration One
C2 = Concentration Two
HA = Not Applicable
HC = Not Calculated
HD = Not Detected

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

2684

Job No.: 0R001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois
Suite F-103
Oak Ridge, TN

Project: DuLuth ANGB

QC Report for Laboratory Sample No(s):
88092323, 88092303-88092304
88092306, 88092314

QC Report No:	TPH-W-0071-88
Sample Matrix:	Water
Conc. Unit:	mg/L
Date Received:	9-09-88
Date Prepared:	9-28-88
Date Analyzed:	10-05-88
Date Reported:	11-01-88
Dilution Factor:	NA

Laboratory Supervisor Approval:

Autiz

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88092306	418.1	<1.5	<1.5	39.5	39.5	100	36.3	92	8	*

2685

* Reporting limit for the samples in this batch is provided by the sub-contract laboratory.

$$\text{Relative Percent Difference (RPD)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{\text{SSR} - \text{SR} \times 100}{\text{SA}}$$

SR = Sample Result
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37824

QC Report No: VGC-W-0047-88
Sample Matrix: Water
Conc. Unit: ug/L
Date Received: 9-12-88
Date Prepared: NA
Date Analyzed: 9-22-88
Date Reported: 10-25-88
Dilution Factor: NA

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88082256, 88092291-88092294
88092303-88092309, 88092312-88092317
88092321, 88082189

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
2586 88092321	Halocarbons: 8010									
	1,1-Dichloroethane	10	ND	9.59	96	9.28	93	3	26	70-130
	Trichloroethene	10	ND	10.2	102	10.3	103	1	19	65-131
	Chlorobenzene	10	ND	10.5	105	10.7	107	2	40	59-137
8897092321	Aromatics: 8020									
	Benzene	10	20	30.8	108	30.8	108	0	20	56-146
	Toluene	10	ND	10.7	107	9.72	97	10	41	42-150
	Chlorobenzene	10	ND	10.1	101	9.37	94	7	36	76-133

$$\text{Relative Percent Difference (PR)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(\text{MS or MSD}) - \text{SR}}{\text{SA}} \times 100$$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge

Attn: Bill Hayden

Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Sample Matrix: Water

Conc. Unit: ug/L

Date Reported: 10-28-88

Laboratory Supervisor Approval: *[Signature]*

Project: Duluth ANGB

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
19	9-14-88	VGC	Carbopack	75-09-2	Dichloromethane	1.5	0.25	88092307-88092308
35	9-15-88	VGC	Carbopack	75-09-2	Dichloromethane	1.4	0.25	88092304, 88092309
50	9-16-88	VGC	Carbopack	75-09-2 67-66-3	Dichloromethane Chloroform	4.6 0.44	0.25 0.05	88092303 88092305-88092306

2687

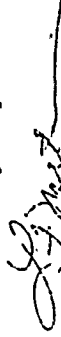
QUALITY CONTROL RESULTS SUMMARY METALS

Job No.: OR001
 Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830

QC Report No: ICP-W-0051-88
 Sample Matrix: Water
 Conc. Unit: ug/L
 Date Received: 9-08-88
 Date Reported: 11-07-88
 Dilution Factor: NA

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
 88092291-88092293, 88092256, 88092303-88092306
 88092312-88092317, 88092321-88092327

Laboratory Supervisor Approval:


Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	C1	Duplicate C2	RPD	SA	SR	Spike Recovery SSR	PR	Notes
Barium	88092291	88092291	10-17-88	10-14-88	6010	<0.2	<0.05	<0.05	NC	2.0	<0.05	1.38	69N	

2688

N - See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

C1 = Concentration One
 C2 = Concentration Two
 SSR = Spiked Sample Result
 SR = Sample Result
 SA = Spike Added (Concentration)

NA = Not Applicable
 NC = Not Calculated
 ND = Not Detected

PESTICIDE/PCB STANDARDS SUMMARY

Job No.: OR001

Instrument ID: 5890 #2

GC Column ID: OV-1

Client: ES Oak Ridge

Attn: Bill Hayden

Address: 710 S. Illinois Avenue

Suite F-103

Oak Ridge, Tn. 37830

Date Reported: 11-14-88

Project: Duluth ANGB

Date(s) of Analysis	From: 10-04-88	Date of Analysis:	10-06-88
	To: 10-06-88	Time of Analysis:	02:23
Time(s) of Analysis	From: 11:17	Lab Sample ID:	
	To: 23:10	(Standard)	

Compound	RT	RT Window		Calibration Factor	RT	Calibration Factor	QNT Y/N	%D
		From	To					
alpha-BHC	1.37			342833	1.37	346800	Y	1.2
beta-BHC	1.47			164292	1.46	162338	Y	1.2
delta-BHC	1.66			218617	1.65	223300	Y	2.1
gamma-BHC	1.61			312287				
Heptachlor	2.61			375600				
Aldrin	3.24			289633				
Hept. Epoxide	3.97			293033				
Endosulfan I	4.96			268850				
Dieldrin	5.81			246350				
4,4'-DDE	5.87			256233	5.85	260117	Y	1.5
Endrin	6.50			244367	6.47	244967	Y	0.2
Endosulfan II	6.62			287442				
4,4'-DDD	7.42			188158	7.40	192808	Y	2.5
Endo. Sulfate	8.60			178158	8.57	183383	Y	2.9
4,4'-DDT	9.79			201217				
Methoxychlor	14.85			140958				
Endrin Ketone	11.06			300750	11.02	320183	Y	6.5
a. Chlordane	5.07			307883	5.05	308883	Y	0.3
g. Chlordane	4.56			292750	4.54	297100	Y	1.5
Toxaphene								
Aroclor-1016								
Aroclor-1221								
Aroclor-1232								
Aroclor-1242								
Aroclor-1248								
Aroclor-1254								
Aroclor-1260								

Under QNT Y/N: enter Y if quantitation was performed, N if not performed.

%D must be less than or equal to 15.0% for quantitation, and less than or equal to 20.0% for confirmation.

Note: Determining that no compounds were found above the CRQL is a form of quantitation, and therefore at least one column must meet the 15.0% criteria.

For multicomponent analytes, the single largest peak that is characteristic of the component should be used to establish retention time and %D. Identification of such analytes is based primarily on pattern recognition.

2689

PESTICIDE/PCB STANDARDS SUMMARY

Job No.: OR001
 Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830

Instrument ID: 5890 #2
 GC Column ID: OV-1

Date Reported: 11-14-88

Project: Duluth ANGB

		Date(s) of Analysis	From: 10-04-88 To: 10-06-88	Date of Analysis:	10-06-88			
		Time(s) of Analysis	From: 11:17 To: 23:10	Time of Analysis:	09:54			
				Lab Sample ID:	..			
				(Standard)				
Compound	RT	RT Window From To		Calibration Factor	RT	Calibration Factor	QNT Y/N	%D
alpha-BHC	1.37			342833				
beta-BHC	1.47			164292				
delta-BHC	1.66			218617				
gamma-BHC	1.61			312287	1.60	319106	Y	2.2
Heptachlor	2.61			375600	2.60	363383	Y	3.3
Aldrin	3.24			289633	3.23	294033	Y	1.5
Hept. Epoxide	3.97			293033	3.96	297367	Y	1.5
Endosulfan I	4.96			268850	4.94	270883	Y	0.8
Dieldrin	5.81			246350	5.80	250550	Y	1.7
4,4'-DDE	5.87			256233				
Endrin	6.50			244367				
Endosulfan II	6.62			287442	6.61	288767	Y	0.5
4,4'-DDD	7.42			188158				
Endo. Sulfate	8.60			178158				
4,4'-DDT	9.79			201217	9.77	200350	Y	0.4
Methoxychlor	14.85			140958	14.81	139815	Y	0.8
Endrin Ketone	11.06			300750				
a. Chlordane	5.07			307883				
g. Chlordane	4.56			292750				
Toxaphene								
Aroclor-1016								
Aroclor-1221								
Aroclor-1232								
Aroclor-1242								
Aroclor-1248								
Aroclor-1254								
Aroclor-1260								

Under QNT Y/N: enter Y if quantitation was performed, N if not performed.

%D must be less than or equal to 15.0% for quantitation, and less than or equal to 20.0% for confirmation.

Note: Determining that no compounds were found above the CRQL is a form of quantitation, and therefore at least one column must meet the 15.0% criteria.

For multicomponent analytes, the single largest peak that is characteristic of the component should be used to establish retention time and %D. Identification of such analytes is based primarily on pattern recognition.

PESTICIDE/PCB STANDARDS SUMMARY

Job No.: OR001
 Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830

Instrument ID: 5890 #2
 GC Column ID: OV-1

Date Reported: 11-14-88

Project: Duluth ANGB

Date(s) of Analysis	From: 10-04-88 To: 10-06-88	Date of Analysis: 10-06-88 Time of Analysis: 17:21
Time(s) of Analysis	From: 11:17 To: 23:10	Lab Sample ID: (Standard)

Compound	RT	RT Window From To	Calibration Factor	RT	Calibration Factor	QNT Y/N	%D
alpha-BHC	1.37		342833	1.37	365900	Y	6.7
beta-BHC	1.47		164292	1.47	170967	Y	4.1
delta-BHC	1.66		218617	1.66	237150	Y	8.5
gamma-BHC	1.61		312287				
Heptachlor	2.61		375600				
Aldrin	3.24		289633				
Hept. Epoxide	3.97		293033				
Endosulfan I	4.96		268850				
Dieldrin	5.81		246350				
4,4'-DDE	5.87		256233	5.87	277017	Y	8.1
Endrin	6.50		244367	6.49	263417	Y	7.8
Endosulfan II	6.62		287442				
4,4'-DDD	7.42		188158	7.42	203575	Y	2
Endo. Sulfate	8.60		178158	8.59	198983	Y	1.7
4,4'-DDT	9.79		201217				
Methoxychlor	14.85		140958				
Endrin Ketone	11.06		300750	11.05	327375	Y	8.9
a. Chlordane	5.07		307883	5.06	326100	Y	5.9
g. Chlordane	4.56		292750	4.56	311567	Y	6.4
Toxaphene							
Aroclor-1016							
Aroclor-1221							
Aroclor-1232							
Aroclor-1242							
Aroclor-1248							
Aroclor-1254							
Aroclor-1260							

Under QNT Y/N: enter Y if quantitation was performed, N if not performed.

%D must be less than or equal to 15.0% for quantitation, and less than or equal to 20.0% for confirmation.

Note: Determining that no compounds were found above the CRQL is a form of quantitation, and therefore at least one column must meet the 15.0% criteria.

For multicomponent analytes, the single largest peak that is characteristic of the component should be used to establish retention time and %D. Identification of such analytes is based primarily on pattern recognition.

PESTICIDE/PCB STANDARDS SUMMARY

Job No.: OR001
 Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830

Instrument ID: 5890 #2
 GC Column ID: OV-1

Date Reported: 11-14-88

Project: Duluth ANGB

Date(s) of Analysis	From: 10-04-88 To: 10-06-88	Date of Analysis: 10-06-88 Time of Analysis: 20:14
Time(s) of Analysis	From: 11:17 To: 23:10	Lab Sample ID: (Standard)

Compound	RT	RT Window		Calibration Factor	RT	Calibration Factor	QNT Y/N	%D
		From	To					
alpha-BHC	1.37			342833	1.37	365300	Y	6.5
beta-BHC	1.47			164292	1.47	171200	Y	4.2
delta-BHC	1.66			218617	1.66	233267	Y	6.7
gamma-BHC	1.61			312287				
Heptachlor	2.61			375600				
Aldrin	3.24			289633				
Hept. Epoxide	3.97			293033				
Endosulfan I	4.96			268850				
Dieldrin	5.81			246350				
4,4'-DDE	5.87			256233	5.86	278783	Y	8.8
Endrin	6.50			244367	6.48	257917	Y	5.5
Endosulfan II	6.62			287442				
4,4'-DDD	7.42			188158	7.41	204950	Y	8.9
Endo. Sulfate	8.60			178158	8.58	191858	Y	7.7
4,4'-DDT	9.79			201217				
Methoxychlor	14.85			140958				
Endrin Ketone	11.06			300750	11.03	319400	Y	6.2
a. Chlordane	5.07			307883	5.06	325700	Y	5.8
g. Chlordane	4.56			292750	4.55	310050	Y	5.9
Toxaphene								
Aroclor-1016								
Aroclor-1221								
Aroclor-1232								
Aroclor-1242								
Aroclor-1248								
Aroclor-1254								
Aroclor-1260								

Under QNT Y/N: enter Y if quantitation was performed, N if not performed.

%D must be less than or equal to 15.0% for quantitation, and less than or equal to 20.0% for confirmation.

Note: Determining that no compounds were found above the CRQL is a form of quantitation, and therefore at least one column must meet the 15.0% criteria.

For multicomponent analytes, the single largest peak that is characteristic of the component should be used to establish retention time and %D. Identification of such analytes is based primarily on pattern recognition.

PESTICIDE/PCB STANDARDS SUMMARY

Job No.: OR001

Instrument ID: 5890 #2

GC Column ID: OV-1

Client: ES Oak Ridge

Attn: Bill Hayden

Address: 710 S. Illinois Avenue

Suite F-103

Oak Ridge, Tn. 37830

Date Reported: 11-14-88

Project: Duluth ANGB

Date(s) of Analysis	From: 10-04-88	Date of Analysis:	10-06-88
Time(s) of Analysis	To: 10-06-88	Time of Analysis:	22:23
	From: 11:17	Lab Sample ID:	
	To: 23:10	(Standard)	

Compound	RT	RT Window From To	Calibration Factor	RT	Calibration Factor	QNT Y/N	%D
alpha-BHC	1.37		342833				
beta-BHC	1.47		164292				
delta-BHC	1.66		218617				
gamma-BHC	1.61		312287	1.60	336700	Y	7.8
Heptachlor	2.61		375600	2.60	397933	Y	5.9
Aldrin	3.24		289633	3.23	304183	Y	5.0
Hept. Epoxide	3.97		293033	3.96	319850	Y	9.2
Endosulfan I	4.96		268850	4.94	279750	Y	4.1
Dieldrin	5.81		246350	5.79	258717	Y	5.0
4,4'-DDE	5.87		256233				
Endrin	6.50		244367				
Endosulfan II	6.62		287442	6.60	292600	Y	1.8
4,4'-DDD	7.42		188158				
Endo. Sulfate	8.60		178158				
4,4'-DDT	9.79		201217	9.76	226550	Y	12.6
Methoxychlor	14.85		140958	14.81	144690	Y	2.6
Endrin Ketone	11.06		300750				
a. Chlordane	5.07		307883				
g. Chlordane	4.56		292750				
Toxaphene							
Aroclor-1016							
Aroclor-1221							
Aroclor-1232							
Aroclor-1242							
Aroclor-1248							
Aroclor-1254							
Aroclor-1260							

Under QNT Y/N: enter Y if quantitation was performed, N if not performed.

%D must be less than or equal to 15.0% for quantitation, and less than or equal to 20.0% for confirmation.

Note: Determining that no compounds were found above the CRQL is a form of quantitation, and therefore at least one column must meet the 15.0% criteria.

For multicomponent analytes, the single largest peak that is characteristic of the component should be used to establish retention time and %D. Identification of such analytes is based primarily on pattern recognition.

PESTICIDE/PCB STANDARDS SUMMARY

Job No.: OR001

Instrument ID: 5890 #2

GC Column ID: OV-1

Client: ES Oak Ridge

Attn: Bill Hayden

Address: 710 S. Illinois Avenue

Suite F-103

Oak Ridge, Tn. 37830

Date Reported: 11-14-88

Project: Duluth ANGB

Date(s) of Analysis	From: 10-04-88	Date of Analysis:	10-06-88
Time(s) of Analysis	To: 10-06-88	Time of Analysis:	23:10
	From: 11:17	Lab Sample ID:	
	To: 23:10	(Standard)	

Compound	RT	RT Window From To	Calibration Factor	RT	Calibration Factor	QNT Y/N	%D
alpha-BHC	1.37		342833	1.36	375767	Y	9.6
beta-BHC	1.47		164292	1.46	175733	Y	7.0
delta-BHC	1.66		218617	1.65	242483	Y	10.9
gamma-BHC	1.61		312287				
Heptachlor	2.61		375600				
Aldrin	3.24		289633				
Hept. Epoxide	3.97		293033				
Endosulfan I	4.96		268850				
Dieldrin	5.81		246350				
4,4'-DDE	5.87		256233	5.85	281083	Y	9.7
Endrin	6.50		244367	6.47	265050	Y	8.5
Endosulfan II	6.62		287442				
4,4'-DDD	7.42		188158	7.39	211867	Y	12.6
Endo. Sulfate	8.60		178158	8.56	195317	Y	9.6
4,4'-DDT	9.79		201217				
Methoxychlor	14.85		140958				
Endrin Ketone	11.06		300750	11.02	328425	Y	9.2
a. Chlordane	5.07		307883	5.04	331600	Y	7.7
g. Chlordane	4.56		292750	4.54	313950	Y	7.2
Toxaphene							
Aroclor-1016							
Aroclor-1221							
Aroclor-1232							
Aroclor-1242							
Aroclor-1248							
Aroclor-1254							
Aroclor-1260							

Under QNT Y/N: enter Y if quantitation was performed, N if not performed.

%D must be less than or equal to 15.0% for quantitation, and less than or equal to 20.0% for confirmation.

Note: Determining that no compounds were found above the CRQL is a form of quantitation, and therefore at least one column must meet the 15.0% criteria.

For multicomponent analytes, the single largest peak that is characteristic of the component should be used to establish retention time and %D. Identification of such analytes is based primarily on pattern recognition.

48

Work Order No.:

Lab File ID: S0215/216

Matrix: water

Level (low/med):

Date Analyzed: 10-23-88

Time Analyzed: 19:43, 21:43

Instrument ID:

Date Reported:

Project: Duluth

This Method Blank applies to the following samples, MS and MSD.

[illegible]

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: TPH-W-0071-88
Sample Matrix: Water
Conc. Unit: mg/L
Date Received: 9-09-88
Date Prepared: 9-28-88
Date Analyzed: 10-05-88
Date Reported: 11-01-88
Dilution Factor: NA

Project: Duluth ANGB
Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88092323, 88092303-88092304
88092306, 88092314

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88092306	418.1	<1.5	<1.5	39.5	39.5	100	36.3	92	8	*

2696

* Reporting limit for the samples in this batch is provided by the sub-contract laboratory.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$
Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

NA = Not Applicable
NC = Not Calculated
ND = Not Detected
SR = Sample Result
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001 QC Report No: TPH-W-0072-88
Client: ES Oak Ridge Sample Matrix: Water
Attn: Bill Hayden Conc. Unit: mg/L
Address: 710 S. Illinois Avenue Date Received: NA
Suite F-103 Date Prepared: 9-23-88
Oak Ridge, Tn. 37830 Date Analyzed: 9-26-88
Date Reported: 11-01-88
Dilution Factor: NA

Project: Duluth ANGB Laboratory Supervisor Approval:
QC Report for Laboratory Sample No(s):
88092291-88092293, 88092305-88092306
88092314-88092317, 88092312, 88092321,
88092354, 88092324, 88092349, 88092388-88092390

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
Blank	418.1	<1.5	<1.5	39.5	38.5	97	37.5	95	3	*
2697										

* See Case Narrative attached.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$ NA = Not Applicable
Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$ NC = Not Calculated
SR = Sample Result ND = Not Detected
SA = Spike Added (Concentration)

FILE CONTINUED
24 Oct 88

50V
9/15/88

VOLATILE CONTINUING CALIBRATION CHECK

LabName: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID.: CARPopak Calibration Date(s): 9/15/89

LAB FILE ID: 30,31 Init. Calib. Date(s): 9/13/89 9/14/89

COMPOUND	RRF	RRF50	%D
Benzyl chloride	0.32	0.34	6
bis (2-chloroethoxy methane	—	—	—
bis (2-chloroisopropyl ether	—	—	—
Bromobenzene	1.0	1.1	10
Bromodichloromethane	3.0	3.1	3
Bromoform	1.7	1.7	0
Bromomethane	—	0.20	—
Carbon tetrachloride	4.0	3.6	10
Chloroacetaldehyde	—	—	—
Chlorobenzene	1.2	1.2	0
Chloroethane	0.45	0.40	10
Chloroform	4.2	3.5	17
1-Chlorohexane	0.87	0.93	7
2-Chloroethyl vinyl ether	—	—	—
Chloromethane	0.79	0.63	20
Chloromethyl methyl ether	—	—	—
o, m, & p-Chlorotoluenes	3.5	4.5	28
Dibromochloromethane	3.4	3.2	6
Dibromomethane	2.4	2.3	4
c 1,2-Dichlorobenzene	2.2	2.1	4
m 1,3-Dichlorobenzene	1.9	1.9	0
p 1,4-Dichlorobenzene	1.9	1.7	10
Dichlorodifluormethane	—	—	—
1,1-Dichloroethane	2.3	1.9	17
1,2-Dichloroethane	2.6	2.2	15
1,1-Dichloroethylene	2.6	2.1	19
trans-1,2-dichloroethylene	2.4	2.1	12
Dichloromethane	3.5	2.9	17
1,2-Dichloropropane	2.3	2.0	13
1,3-Dichloropropylene	4.5	4.1	18
1,1,2,2-Tetrachloroethane	6.5	6.1	6
1,1,1,2-Tetrachloroethane	4.1	4.9	20
Tetrachloroethylene	6.7	6.1	6
1,1,1-Trichloroethane	2.9	2.5	14
1,1,2-Trichloroethane	4.5	4.1	9
Trichloroethylene	5.1	3.3	15
Trichlorofluoromethane	2.4	1.9	20
Trichloropropane	2.0	1.6	20
Vinyl chloride	0.98	0.77	21

8801. 0.4
1.3
2.1
2.2
2.0
1.1
1.5
2.0

VOLATILE CONTINUING CALIBRATION CHECK

50V
9/15/88

LabName: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID.: CARBopak Calibration Date(s): 9/15/89

LAB FILE ID: 30 Init. Calib. Date(s): 9/13/89 9/14/89

COMPOUND	RRF	RRF50	%D
Benzene	4.6	4.9	7
Chlorobenzene	4.7	5.2	10
1,2_Dichlorobenzene	3.7	3.8	3
1,3_Dichlorobenzene	4.3	4.4	2
1,4_Dichlorobenzene	3.3	3.4	3
Ethyl Benzene	3.5	3.6	3
Toluene	3.7	3.6	3
Xylenes	12	11	8

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DATA PACKAGE #48

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ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the soil samples received
by this laboratory on 9-01-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88082254	DANGB4-MW24-SS1	BA-I	8-31-88		10-20-88	
88082254	DANGB4-MW24-SS1	CD-F	8-31-88		10-20-88	
88082254	DANGB4-MW24-SS1	CR-F	8-31-88		10-20-88	
88082254	DANGB4-MW24-SS1	PB-F	8-31-88		10-20-88	
88082254	DANGB4-MW24-SS1	418.1	8-31-88	9-22-88	9-23-88	
88082254	DANGB4-MW24-SS1	MOIS	8-31-88		9-09-88	
88082254	DANGB4-MW24-SS1	8010	8-31-88		9-13-88	9-12-88
88082254	DANGB4-MW24-SS1	8020	8-31-88		9-13-88	9-12-88
88082255	DANGB4-MW24-SS1A	BA-I	8-31-88		10-20-88	
88082255	DANGB4-MW24-SS1A	CD-F	8-31-88		10-20-88	
88082255	DANGB4-MW24-SS1A	CR-F	8-31-88		10-20-88	
88082255	DANGB4-MW24-SS1A	PB-F	8-31-88		10-22-88	
88082255	DANGB4-MW24-SS1A	418.1	8-31-88	9-22-88	9-23-88	
88082255	DANGB4-MW24-SS1A	MOIS	8-31-88		9-09-88	
88082255	DANGB4-MW24-SS1A	8010	8-31-88		9-13-88	9-12-88
88082255	DANGB4-MW24-SS1A	8020	8-31-88		9-13-88	9-12-88

* If applicable

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88092254-88092255
WORK ORDER NO.: 942

These soil samples were received at the ES Berkeley Laboratory
on 9-01-88. They were received cold and intact.

ANALYSIS REPORT

WORK ORDER NUMBER: 942
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/01/88

APPROVED BY Chas. K. Smith
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 2, UNITS: mg/Kg

TEST COMPOUND	DANGB4, MW24, SS1	DANGB4, MW24, SS1A
ACID DIG SOIL	88092254	88092255
BARIIUM	NA	NA
CADMIUM	42.7	81.1
CHROMIUM	8.0N	15.7N
LEAD	27.3	49.7
	4.9	21.6

ND - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 942
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/01/88

APPROVED BY *[Signature]*
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
10 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 3, UNITS: mg/Kg

TEST COMPOUND	DANGB4, MW24, SS1	DANGB4, MW24, SS1A
-----	88092254	88092255
-----	-----	-----
18.1 PETROLEUM HYDROCARBONS	51	24
MOISTURE	9.6	8.4

ID - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 942
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/01/88

APPROVED BY

RWB

Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/Kg, GROUP 8010

TEST COMPOUND	DANGB4, MW24, SS1 88092254	DANGB4, MW24, SS1A 88092255
BENZYL CHLORIDE	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND
BIS (2-CHLOROISOPROPYL) ETHER	ND	ND
BROMOBENZENE	ND	ND
BROMODICHLOROMETHANE	ND	ND
BROMOFORM	ND	ND
BROMOETHANE	ND	ND
CARBON TETRACHLORIDE	ND	ND
CHLORACETALDEHYDE	ND	ND
CHLORAL	ND	ND
CHLOROBENZENE	ND	ND
CHLOROETHANE	ND	ND
CHLOROFORM	ND	ND
1-CHLOROHEXANE	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND
CHLOROMETHANE	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND
CHLOROTOLUENE	ND	ND
DIBROMOCHLOROMETHANE	ND	ND
DIBROMOMETHANE	ND	ND
1,2-DICHLOROBENZENE	ND	ND
1,3-DICHLOROBENZENE	ND	ND
1,4-DICHLOROBENZENE	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND
1,1-DICHLOROETHANE	ND	ND
1,2-DICHLOROETHANE	ND	ND
1,1-DICHLOROETHYLENE	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND
DICHLOROMETHANE	2.2B	4.0B
1,2-DICHLOROPROPANE	ND	ND

ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 942

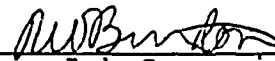
TEST COMPOUND	DANGB4, MW24, SS1 88092254	DANGB4, MW24, SS1A 88092255
1,3-DICHLOROPROPYLENE	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND
1,1,1,2-TETRACHLOROETHANE	ND	ND
TETRACHLOROETHYLENE	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND
TRICHLOROETHYLENE	ND	ND
TRICHLOROFLUOROMETHANE	ND	ND
TRICHLOROPROPANE	ND	ND
VINYL CHLORIDE	ND	ND

ID - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 942
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/01/88

APPROVED BY


Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/Kg, GROUP 8020

TEST COMPOUND	DANGB4, MW24, SS1 88092254	DANGB4, MW24, SS1A 88092255
BENZENE	ND	ND
CHLOROBENZENE	ND	ND
1,2-DICHLOROBENZENE	ND	ND
1,3-DICHLOROBENZENE	ND	ND
1,4-DICHLOROBENZENE	ND	ND
ETHYL BENZENE	ND	ND
TOLUENE	ND	ND
XYLENES	ND	ND

ND - Not Detected

3

3

3

QUALITY CONTROL RESULTS SUMMARY METALS

Job No.: OR001
 Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830

QC Report No: ICP-S-0033-88
 Sample Matrix: Soil
 Conc. Unit: mg/KG
 Date Received: 8-31-88
 Date Reported: 10-28-88
 Dilution Factor: NA
 %Moisture: 8.1

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
 88082200-88082203, 88092223-88092227
 88092244-88092246, 88092248-88092249
 88092252-88092255

Laboratory Supervisor Approval:
[Signature]

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	C1	Duplicate C2	RPD	SA	SR	SSR	PR	Notes
Barium	88082200	88082200	10-20-88	10-18-88	SW6010	<20	55.8	52.6	7	218	55.8	254	91	
Cadmium	88082200	88082200	10-20-88	10-18-88	SW6010	<0.5	7.4	8.7	16	5.4	7.4	11.0	67N	
Chromium	88082200	88082200	10-20-88	10-18-88	SW6010	<1.0	31.8	37.3	16	21.8	31.8	56.7	114	
Lead	88082200	88082200	10-20-88	10-18-88	SW6010	<10	<10	<10	NC	54.4	<10	49.2	90	A

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
 A Sample results for lead are reported from Furnace analyses for the following
 Sample No(s): 88082200-88082203, 88082244, 88092248-88092249, 88092252, 88092255.
 N See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$ C1 = Concentration One C2 = Concentration Two NA = Not Applicable
 NC = Not Calculated ND = Not Detected

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$ SSR = Spiked Sample Result SR = Sample Result SA = Spike Added (Concentration)

Job No.:

OR001

Client:

ES Oak Ridge

Attn:

Bill Hayden

Address:

710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project:

Duluth ANGB

QC Report for Laboratory Sample No(s):

88092223-88092227
88092244-88092255

QC Report No:

TPH-S-0075-88

Sample Matrix:

Soil

Conc. Unit:

mg/KG

Date Received:

NA

Date Prepared:

9-22-88

Date Analyzed:

9-23-88

Date Reported:

11-02-88

Dilution Factor:

NA

%Moisture:

NA

Laboratory Supervisor Approval:

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
Blank	418.1	<10	8.6J	39.5	38.5	76	37.5	73	3	*

2712

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

J See Legend attached.

* The reporting limit for the sample in this batch is provided by the sub-contract laboratory.

$$\text{Relative Percent Difference (RPD)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

MS = Spike Sample
MSD = Spike Duplicate
NA = Not Applicable
NC = Not Calculated
ND = Not Detected

$$\text{Percent Recovery (PR)} = \frac{\text{SSR} - \text{SR}}{\text{SA}} \times 100$$

SR = Sample Result
SA = Spike Added (Concentration)

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO(S).: VGC-S-0060-88
QC REPORT NO(S).: VGC-S-0060-88B

Percent recovery and relative percent difference for some of the matrix spiking compounds are outside ES Laboratory acceptance limits. A blank spike analysis shows the laboratory to be in control.

Results for Sample No. 88092739 are reported on a wet weight basis, since percentage moisture was not performed.

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: VGC-S-0049-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 9-01-88
Date Prepared: NA
Date Analyzed: 9-13-88
Date Reported: 10-26-88
Dilution Factor: NA
% Moisture: 17.4

Project: Duluth ANGB
Laboratory Supervisor Approval: 

QC Report for Laboratory Sample No(s):
88082244-88082254

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
88082244	Halocarbons: 8010									
	1,1-dichloroethane	12.1	ND	10.6	88	10.1	83	5	20	58-124
	Trichloroethene	12.1	ND	11.5	95	12.2	101	6	16	75-110
	Chlorobenzene	12.1	ND	11.3	93	11.9	98	5	21	71-125
88082244	Aromatics: 8020									
	Benzene	12.1	ND	10.9	90	12.1	100	10	26	75-123
	Toluene	12.1	ND	10.9	90	12.1	100	10	16	79-115
	Chlorobenzene	12.1	ND	10.6	88	11.7	97	10	24	82-112

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

$$\text{Relative Percent Difference (PR)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(\text{MS or MSD}) - \text{SR}}{\text{SA}} \times 100$$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001 QC Report No: VGC-S-0060-88
Client: ES Oak Ridge Sample Matrix: Soil
Attn: Bill Hayden Conc. Unit: ug/KG
Address: 710 S. Illinois Avenue Date Received: 9-27-88
Suite F-103 Date Prepared: NA
Oak Ridge, Tn. 37830 Date Analyzed: 10-10-88
Date Reported: 11-03-88
Dilution Factor: NA
% Moisture: NT

Project: Duluth ANGB Laboratory Supervisor Approval: AWB

QC Report for Laboratory Sample No(s):
88092672-88092676, 88092731-88092741
88092781-88092783, 88082255

Laboratory Sample No.	Compound	SA	SR	HS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
88092739	Halocarbons: 8010									
	1,1-dichloroethane	10	ND	8.32	83	5.50	55*	41*	20	58-124
	Trichloroethene	10	ND	7.90	79	6.34	63*	22*	16	75-110
	Chlorobenzene	10	ND	6.06	61*	5.21	52*	15	21	71-125
88092739	Aromatics: 8020									
	Benzene	10	2.3	13.8	115	8.33	60*	49*	26	75-123
	Toluene	10	5.5	16.6	111	11.3	58*	38*	16	79-115
	Chlorobenzene	10	ND	9.40	94	8.21	82	14	24	82-112

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

* See Case Narrative attached.

$$\text{Relative Percent Difference (PR)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(\text{MS or MSD}) - \text{SR}}{\text{SA}} \times 100$$

HS = Spike Sample

MSD = Spike Sample Duplicate

SR = Sample Result

SA = Spike Added (Concentration)

NA = Not Applicable

NC = Not Calculated

ND = Not Detected

NT = Not Tested

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8920

Job No.: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: VGC-S-0060-88B
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: NA
Date Prepared: NA
Date Analyzed: 10-10-88
Date Reported: 11-03-88
Dilution Factor: NA
% Moisture: NA

Project: Duluth ANGB
Laboratory Supervisor Approval: NA DB w/ 7/10/88

QC Report for Laboratory Sample No(s):
88092672-88092676, 88092731-88092741
88092781-88092783, 88082255

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
2716	Halocarbons: 8010									
	1,1-dichloroethane	10	ND	9.46	95	10.4	104	9	20	58-124
	Trichloroethene	10	ND	9.33	93	9.61	96	3	16	75-110
	Chlorobenzene	10	ND	8.78	88	9.11	91	4	21	71-125
Blank	Aromatics: 8020									
	Benzene	10	ND	9.24	92	10.0	100	8	26	75-123
	Toluene	10	ND	9.38	94	9.53	95	2	16	79-115
	Chlorobenzene	10	ND	9.10	91	9.25	92	2	24	82-112

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

$$\text{Relative Percent Difference (PR)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(\text{MS or MSD}) - \text{SR}}{\text{SA}} \times 100$$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No:

OR001

Client:

ES Oak Ridge

Attn:

Bill Hayden

Address:

710 S. Illinois Avenue

Suite F-103

Oak Ridge, Tn. 37830

Project:

Duluth ANGB

Sample Matrix:

Soil

Conc. Unit:

ug/Kg

Date Reported:

11-03-88

Laboratory Supervisor Approval:

[Signature]

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
92 2717	9-13-88	VGC	Carbopack	75-09-2	Dichloromethane 1,3-Dichlorobenzene	2.5 4.4	0.25 0.32	88092251-88092255

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DATA PACKAGE #49

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**ENGINEERING-SCIENCE, INC.**600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the soil samples received
by this laboratory on 8-20-88.Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88082000	DANGB4-MW23-SS1	BA-I	8-19-88		9-18-88	
88082000	DANGB4-MW23-SS1	CD-F	8-19-88		9-16-88	
88082000	DANGB4-MW23-SS1	CR-F	8-19-88		9-16-88	
88082000	DANGB4-MW23-SS1	PB-F	8-19-88		9-22-88	
88082000	DANGB4-MW23-SS1	418.1	8-19-88	9-15-88	9-15-88	
88082000	DANGB4-MW23-SS1	MOIS	8-19-88		8-29-88	
88082000	DANGB4-MW23-SS1	8010	8-19-88		8-31-88	8-31-88
88082000	DANGB4-MW23-SS1	8020	8-19-88		8-31-88	8-31-88
88082001	DANGB4-MW23-SS2	BA-I	8-19-88		9-18-88	
88082001	DANGB4-MW23-SS2	CD-F	8-19-88		9-16-88	
88082001	DANGB4-MW23-SS2	CR-F	8-19-88		9-16-88	
88082001	DANGB4-MW23-SS2	PB-F	8-19-88		9-22-88	
88082001	DANGB4-MW23-SS2	418.1	8-19-88	9-15-88	9-15-88	
88082001	DANGB4-MW23-SS2	MOIS	8-19-88		8-29-88	
88082001	DANGB4-MW23-SS2	8010	8-19-88		8-31-88	8-31-88
88082001	DANGB4-MW23-SS2	8020	8-19-88		8-31-88	8-31-88
88082002	DANGB4-MW23-SS3	BA-I	8-19-88		9-18-88	
88082002	DANGB4-MW23-SS3	CD-F	8-19-88		9-16-88	
88082002	DANGB4-MW23-SS3	CR-F	8-19-88		9-16-88	
88082002	DANGB4-MW23-SS3	PB-F	8-19-88		9-22-88	
88082002	DANGB4-MW23-SS3	418.1	8-19-88	9-15-88	9-15-88	
88082002	DANGB4-MW23-SS3	MOIS	8-19-88		8-29-88	
88082002	DANGB4-MW23-SS3	8010	8-19-88		8-31-88	8-31-88
88082002	DANGB4-MW23-SS3	8020	8-19-88		8-31-88	8-31-88

* If applicable

88-A1-DULU0317 1

CL-FRM01

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88082000-88082002
WORK ORDER NO.: 886

These soil samples were received at the ES Berkeley Laboratory on 8-20-88. They were received cold and intact.

DETECTION LIMITS
 HALOGENATED VOLATILE ORGANICS
 EPA METHOD 8010
 SAMPLES NO.: 88082000-88082002

Compound	Detection Limits
Benzyl chloride	0.50 ug/KG
bis(2-chloroethoxy)methane	5.0 ug/KG
bis(2-chloroisopropyl)ether	5.0 ug/KG
Bromobenzene	0.50 ug/KG
Bromodichloromethane	0.10 ug/KG
Bromoform	0.20 ug/KG
Bromomethane	1.2 ug/KG
Carbon Tetrachloride	0.12 ug/KG
Chloroacetaldehyde	50.0 ug/KG
Chloral	50.0 ug/KG
Chlorobenzene	0.25 ug/KG
Chloroethane	0.52 ug/KG
Chloroform	0.05 ug/KG
1-Chlorohexane	0.50 ug/KG
2-Chloroethyl vinyl ether	0.13 ug/KG
Chloromethane	0.08 ug/KG
Chloromethyl methyl ether	5.0 ug/KG
O-,m-, & p-Chlorotoluenes	0.50 ug/KG
Dibromochloromethane	0.09 ug/KG
Dibromomethane	0.50 ug/KG
1,2-Dichlorobenzene	0.15 ug/KG
1,3-Dichlorobenzene	0.32 ug/KG
1,4-Dichlorobenzene	0.24 ug/KG
Dichlorodifluoromethane	1.8 ug/KG
1,1-Dichloroethane	0.07 ug/KG
1,2-Dichloroethane	0.03 ug/KG
1,1-Dichloroethylene	0.13 ug/KG
trans-1,2-Dichloroethylene	0.10 ug/KG
Dichloromethane	0.25 ug/KG
1,2-Dichloropropane	0.04 ug/KG
trans-1,3-Dichloropropylene	0.34 ug/KG
1,1,2,2-Tetrachloroethane	0.03 ug/KG
1,1,1,2-Tetrachloroethane	0.50 ug/KG
Tetrachloroethylene	0.03 ug/KG
1,1,1-Trichloroethane	0.03 ug/KG
1,1,2-Trichloroethane	0.02 ug/KG
Trichloroethylene	0.12 ug/KG
Trichlorofluoromethane	0.50 ug/KG
Trichloropropane	0.50 ug/KG
Vinyl chloride	0.18 ug/KG

The method detection limits listed are based upon the EPA method listed. Dilution or other deviations from the normal procedures, required due to characteristics of a sample, will influence these values. These changes are described in the report narrative if applicable.

DETECTION LIMITS
AROMATIC VOLATILE ORGANICS
EPA METHOD 8020
SAMPLES NO.: 88082000-88082002

Compound	Detection Limits
Benzene	0.2 ug/Kg
Chlorobenzene	0.2 ug/Kg
1,2-Dichlorobenzene	0.4 ug/Kg
1,3-Dichlorobenzene	0.4 ug/Kg
1,4-Dichlorobenzene	0.3 ug/Kg
Ethylbenzene	0.2 ug/Kg
Toluene	0.2 ug/Kg
Xylenes (Dimethyl benzene)	0.4 ug/Kg

The method detection limits listed are based upon the EPA method listed. Dilution or other deviations from the normal procedures, required due to characteristics of a sample, will influence these values. These changes are described in the report narrative if applicable.

ANALYSIS REPORT

WORK ORDER NUMBER: 886
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/20/88

APPROVED BY *Am.T.*
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1.

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 2, UNITS: mg/Kg

TEST COMPOUND	DANGB4-MW23-SS1 8-19-88 88082000	DANGB4-MW23-SS2 8-19-88 88082001	DANGB4-MW23-SS3 8-19-88 88082002
ACID DIG SOIL	NA	NA	NA
BARIUM	51.3	51.4	27.9
CADMIUM	10.6*N	8.5*N	9.8*N
CHROMIUM	23.6	23.7	20.4
LEAD	3.2NS	4.2N	2.6N

NA - Not Analyzed

ND - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 886
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/20/88

APPROVED BY *[Signature]*
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

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OAK RIDGE, TN 37830

NO. OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 3, UNITS: mg/Kg

TEST COMPOUND	DANGB4-MW23-SS1 8-19-88 88082000	DANGB4-MW23-SS2 8-19-88 88082001	DANGB4-MW23-SS3 8-19-88 88082002
18.1 PETROLEUM HYDROCARBONS	370	<100	<100
MOISTURE	11.7	16.1	12.3

ANALYSIS REPORT

WORK ORDER NUMBER: 886
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/20/88

APPROVED BY *Bill Hayden*
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/Kg, GROUP 8010

	DANGB4-MW23-SS1	DANGB4-MW23-SS2	DANGB4-MW23-SS3
	8-19-88	8-19-88	8-19-88
TEST COMPOUND	88082000	88082001	88082002
-----	-----	-----	-----
BENZYL CHLORIDE	ND	ND	ND
BIS (2-CHLOROETHOXY) METHANE	ND	ND	ND
BIS (2-CHLOROISOPROPYL) ETHER	ND	ND	ND
BROMOBENZENE	ND	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND
BROMOFORM	ND	ND	ND
BROMOETHANE	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND
CHLORACETALDEHYDE	ND	ND	ND
CHLORAL	ND	ND	ND
CHLOROBENZENE	ND	ND	ND
CHLOROETHANE	ND	ND	ND
CHLOROFORM	ND	0.40B	0.08B
1-CHLOROHEXANE	ND	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND	ND
CHLOROMETHANE	ND	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND	ND
CHLOROTOLUENE	ND	ND	ND
DIBROMOCHLOROMETHANE	ND	ND	ND
DIBROMOMETHANE	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND
1,1-DICHLOROETHYLENE	ND	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND	ND
DICHLOROMETHANE	8.4B	3.2B	5.4B
1,2-DICHLOROPROPANE	ND	ND	ND

ANALYSIS REPORT FOR WORK ORDER NUMBER 886

TEST COMPOUND	DANGB4-MW23-SS1	DANGB4-MW23-SS2	DANGB4-MW23-SS3
	8-19-88	8-19-88	8-19-88
	88082000	88082001	88082002
1,3-DICHLOROPROPYLENE	ND	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND	ND
1,1,1,2-TETRACHLOROETHANE	ND	ND	ND
TETRACHLOROETHYLENE	ND	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND
TRICHLOROFLUOROMETHANE	ND	ND	ND
TRICHLOROPROPANE	ND	ND	ND
VINYL CHLORIDE	ND	ND	ND

ANALYSIS REPORT

WORK ORDER NUMBER: 886
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/20/88

APPROVED BY

NW Buxton
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/Kg, GROUP 8020

TEST COMPOUND	DANGB4-MW23-SS1 8-19-88 88082000	DANGB4-MW23-SS2 8-19-88 88082001	DANGB4-MW23-SS3 8-19-88 88082002
BENZENE	ND	ND	ND
CHLOROBENZENE	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND
ETHYL BENZENE	ND	ND	ND
TOLUENE	1.2	25	13
XYLENES	ND	ND	ND

2

[illegible]

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

QUALITY CONTROL RESULTS SUMMARY METALS

Job No.: OR001
 Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830

QC Report No: TCR-S-0027-88
 Sample Matrix: Soil
 Conc. Unit: mg/KG
 Date Received: 8-15-88
 Date Reported: 10-13-88
 Dilution Factor: NA
 Moisture: 9.6

Project: Duluth ANGB
 Laboratory Supervisor Approval: *[Signature]*

QC Report for Laboratory Sample No(s):
 88081877-88081879, 88081883-88081890
 88081938-88081942, 88082000-88082002 ✓

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	C1	Duplicate C2	RPD	SA	SR	SSR	PR	Moist.
Barium	88081879	88081879	9-18-88	9-09-88	6010	<20	40.2	37.2	8	221	40.2	275	106	
Cadmium	88081879	88081879	9-16-88	9-09-88	6010	<0.5	6.31	10.6	51*	5.53	6.31	14.6	150N	
Chromium	88081879	88081879	9-16-88	9-09-88	6010	<1.0	20.9	22.7	8	22.1	20.9	47.0	118	

2732

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
 * See Legend attached.
 N See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$
 C1 = Concentration One
 C2 = Concentration Two

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$
 SSR = Spiked Sample Result
 SR = Sample Result
 SA = Spike Added (Concentration)

NA = Not Applicable
 NC = Not Calculated
 ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY METALS

Job No.: OR001
 Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830

QC Report No: AAF-S-0026-88
 Sample Matrix: Soil
 Conc. Unit: ug/KG
 Date Received: 9-17-88
 Date Reported: 10-10-88
 Dilution Factor: NA
 %Moisture: 15.0

Project: Duluth ANGB
 Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
 88081901-88081906, 88081938-88081942
 88082000-88092002

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	C1	Duplicate C2	RPD	SA	Spike Recovery SR	SSR	PR	Notes
Arsenic	88081902	88081902	10-03-88	9-17-88	7060	<1.0	<5.0E	<5.0E	NC	4.70	4.90E	8.59	79	
Lead	88081902	88081902	9-21-88	9-17-88	7421	<0.5	5.69	5.69	0	~ 98	5.69	9.88	68N	

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

N - See Legend attached.
 E - See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$
 NA = Not Applicable
 NC = Not Calculated
 ND = Not Detected

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$
 SSR = Spiked Sample Result
 SR = Sample Result
 SA = Spike Added (Concentration)

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
Samples No.: 88081877-88081879
Samples No.: 88081883-88081890
Samples No.: 88081938-88081942
Samples No.: 88082000-88082002

The results obtained for the laboratory control sample (LCS) analyzed with these samples for the analytes Cadmium, Chromium, and Barium exceeded the recommended EPA recoveries. All data associated with this batch was closely inspected and no analytical problems were found. The initial and continuing calibration verification standards and blanks and precision and accuracy recoveries were within acceptable limits with the following exceptions:

Cadmium spike recoveries and precision exceeded acceptable limits. The spike sample was followed by an analytical spike as required by laboratory standard operating procedure. The results of the analytical spike recovery for Cadmium were within acceptable ranges.

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.:

OR001

Client:

ES Oak Ridge

Attn:

Bill Hayden

Address:

710 S. Illinois Avenue

Suite F-103

Oak Ridge, Tn. 37830

Project:

Duluth ANGB

QC Report for Laboratory Sample No(s):

88081898-88081906, 88082000-88082002

88082043-88082049

QC Report No: TPH-S-0050-88

Sample Matrix: Soil

Conc. Unit: mg/KG

Date Received: 8-17-88

Date Prepared: 9-12-88

Date Analyzed: 9-13-88

Date Reported: NA

Dilution Factor: 6

%Moisture: 22.2

Laboratory Supervisor Approval:

[Signature]

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88081903	418.1	<100	<100	1300	1000	77	820	63	20	*

2735

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

* Percent recovery (PR) and relative percent difference (RPD) are within ES Laboratory control limits.

$$\text{Relative Percent Difference (RPD)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

MS = Spike Sample
MSD = Spike Duplicate

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

$$\text{Percent Recovery (PR)} = \frac{\text{SSR} - \text{SR}}{\text{SA}} \times 100$$

SR = Sample Result
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: ORO01

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: VGC-S-0038-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 8-20-88
Date Prepared: NA
Date Analyzed: 9-01-88
Date Reported: 9-27-88
Dilution Factor: NA
% Moisture: 11.7

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88081971-88081977
88082000-88082002

Adrian B...

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
88082000 2736	Halocarbons: 8010									
	1,1-dichloroethane	11.3	ND	10.2	90	9.04	80	12	20	58-124
	Trichloroethene	11.3	ND	10.6	94	9.9	88	7	16	75-110
	Chlorobenzene	11.3	ND	10.7	95	9.9	88	8	21	71-125
88082000	Aromatics: 8020									
	Benzene	11.3	ND	10.7	95	9.9	88	8	26	75-123
	Toluene	11.3	ND	11.4	101	10.7	95	6	16	79-115
	Chlorobenzene	11.3	ND	10.5	93	10.1	89	4	24	82-112

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

$$\text{Relative Percent Difference (PR)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(\text{MS or MSD}) - \text{SR} \times 100}{\text{SA}}$$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)
NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No:

OR001

Client:

ES Oak Ridge

Attn:

Bill Hayden

Address:

710 S. Illinois Avenue

Suite F-103

Oak Ridge, Tn. 37830

Project:

Duluth ANGB

Sample Matrix:

Soil

Conc. Unit:

ug/KG

Date Reported:

10-07-88

Laboratory Supervisor Approval:

[Signature]

File ID	Date Analyzed	Fraction	Instru- ment ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
02	8-31-88	VGC	Carbopack	75-09-2 67-66-3	Dichloromethane Chloroform	2.9 0.15	0.25 0.5	88082000-88082002
57	8-30-88	VGC	Carbopack	75-09-2 71-55-6	Dichloromethane 1,1,1-Trichloromethane	4.0 0.35	0.25 0.25	88081971
77	9-26-88	VGC	Carbopack	75-09-2 75-35-4 67-66-3 71-55-6 127-18-4 108-88-3	Dichloromethane 1,1-Dichloroethene Chloroform 1,1,1-Trichloroethane Tetrachloroethene Toluene	2.5 0.41 0.07 0.30 0.32 2.8	0.5 0.13 0.05 0.03 0.12 0.20	88081972-88081977

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DATA PACKAGE #50

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ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the soil samples received
by this laboratory on 8-25-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88082099	DANGB-4-MW24-SS1	BA-I	8-24-88		9-19-88	
88082099	DANGB-4-MW24-SS1	CD-F	8-24-88		9-19-88	
88082099	DANGB-4-MW24-SS1	CR-F	8-24-88		9-19-88	
88082099	DANGB-4-MW24-SS1	PB-F	8-24-88		10-4-88	
88082099	DANGB-4-MW24-SS1	418.1	8-24-88	9-17-88	9-19-88	
88082099	DANGB-4-MW24-SS1	MOIS	8-24-88		9-02-88	
88082099	DANGB-4-MW24-SS1	8010	8-24-88		9-01-88	9-1-88/9-2-88
88082099	DANGB-4-MW24-SS1	8020	8-24-88		9-01-88	9-01-88
88082100	DANGB-4-MW24-SS2	BA-I	8-24-88		9-19-88	
88082100	DANGB-4-MW24-SS2	CD-F	-24-88		9-19-88	
88082100	DANGB-4-MW24-SS2	CR-F	-24-88		9-19-88	
88082100	DANGB-4-MW24-SS2	PB-F	8-24-88		10-4-88	
88082100	DANGB-4-MW24-SS2	418.1	8-24-88	9-17-88	9-19-88	
88082100	DANGB-4-MW24-SS2	MOIS	8-24-88		9-02-88	
88082100	DANGB-4-MW24-SS2	8010	8-24-88		9-01-88	9-1-88/9-2-88
88082100	DANGB-4-MW24-SS2	8020	8-24-88		9-01-88	9-01-88
88082101	DANGB-4-MW24-SS3	BA-I	8-24-88		9-19-88	
88082101	DANGB-4-MW24-SS3	CD-F	8-24-88		9-19-88	
88082101	DANGB-4-MW24-SS3	CR-F	8-24-88		9-19-88	
88082101	DANGB-4-MW24-SS3	PB-F	8-24-88		10-4-88	
88082101	DANGB-4-MW24-SS3	418.1	8-24-88	9-17-88	9-19-88	
88082101	DANGB-4-MW24-SS3	MOIS	8-24-88		9-02-88	
88082101	DANGB-4-MW24-SS3	8010	8-24-88		9-01-88	9-1-88/9-2-88
88082101	DANGB-4-MW24-SS3	8020	8-24-88		9-01-88	9-02-88

* If applicable

88-A1-DULU0295 1

A SUBSIDIARY OF THE PARSONS CORPORATION

2741

CL-FRM01

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88082099-88082101
WORK ORDER NO.: 908

These soil samples were received at the ES Berkeley Laboratory on 8-25-88. They were received cold and intact.

Due to a suspected interelement matrix interference, all cadmium data at levels reportable by ICP analysis (≥ 1 mg/KG dry wt.) are potentially false positives. This is being investigated and follow-up will be provided when available.

11/02/88

ANALYSIS REPORT

WORK ORDER NUMBER: 908
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/25/88

APPROVED BY

Chas Russell
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 2, UNITS: mg/Kg

TEST COMPOUND	DANGB-4-MW24- SS1 88082099	DANGB-4-MW24- SS2 88082100	DANGB-4-MW24- SS3 88082101
ACID DIG SOIL	NA	NA	NA
BARIUM	49.0	40.2	45.9
CADMIUM	11.4N E	8.8N E	11.5N E
CHROMIUM	32.6	25.6	49.3
LEAD	6.4N	2.8*	4.1N

ANALYSIS REPORT

WORK ORDER NUMBER: 908
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/25/88

APPROVED BY


Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920


TASK: 3, UNITS: mg/Kg

TEST COMPOUND	DANGB-4-MW24- SS1 88082099	DANGB-4-MW24- SS2 88082100	DANGB-4-MW24- SS3 88082101
18.1 PETROLEUM HYDROCARBONS	150	<100	<100
% MOISTURE	12.8	14.7	9.3

11/02/88

ANALYSIS REPORT

WORK ORDER NUMBER: 908
 JOB NUMBER : ZB0000000440
 WORK ORDER DATE : 08/25/88

APPROVED BY 
 Lab Supervisor

REPORT DATA:
 ES OAK RIDGE/DULUTH ANGB
 710 S. ILLINOIS AVE. STE. S103
 OAK RIDGE, TN 37830
 BILL HAYDEN

CLIENT DATA:
 ES OAK RIDGE/DULUTH ANGB (134)
 710 S. ILLINOIS AVE. STE. S103
 OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
 CONTACT : BILL HAYDEN
 (615)-481-3920

TASK: 4, UNITS: ug/KG, GROUP 8010

	DANGB-4-MW24- SS1	DANGB-4-MW24- SS2	DANGB-4-MW24- SS3
TEST COMPOUND	88082099	88082100	88082101
BENZYL CHLORIDE	ND	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND	ND
BIS (2-CHLOROISOPROPYL) ETHER	ND	ND	ND
BROMOBENZENE	ND	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND
BROMOFORM	ND	ND	ND
BROMOETHANE	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND
CHLORACETALDEHYDE	ND	ND	ND
CHLORAL	ND	ND	ND
CHLOROBENZENE	ND	ND	ND
CHLOROETHANE	ND	ND	ND
CHLOROFORM	ND	ND	ND
1-CHLOROHEXANE	ND	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND	ND
CHLOROMETHANE	ND	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND	ND
CHLOROTOLUENE	ND	ND	ND
DIBROMOCHLOROMETHANE	ND	ND	ND
DIBROMOMETHANE	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND
1,1-DICHLOROETHYLENE	ND	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND	ND
DICHLOROMETHANE	2.9B	4.3B	3.6B
1,2-DICHLOROPROPANE	ND	ND	ND

ANALYSIS REPORT FOR WORK ORDER NUMBER 908

TEST COMPOUND	DANGB-4-MW24- SS1 88082099	DANGB-4-MW24- SS2 88082100	DANGB-4-MW24- SS3 88082101
1,3-DICHLOROPROPYLENE	ND	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND	ND
1,1,1,2-TETRACHLOROETHANE	ND	ND	ND
TETRACHLOROETHYLENE	ND	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND
TRICHLOROFLUOROMETHANE	ND	ND	ND
TRICHLOROPROPANE	ND	ND	ND
VINYL CHLORIDE	ND	ND	ND

11/02/88

ANALYSIS REPORT

WORK ORDER NUMBER: 908
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/25/88

APPROVED BY

NW Bruster
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/KG, GROUP 8020

TEST COMPOUND	DANGB-4-MW24- SS1 88082099	DANGB-4-MW24- SS2 88082100	DANGB-4-MW24- SS3 88082101
BENZENE	ND	ND	ND
CHLOROBENZENE	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND
ETHYL BENZENE	ND	ND	ND
TOLUENE	39	150	950
XYLENES	ND	ND	ND

ES JOB NO. OR001		PROJECT NAME/LOCATION Duluth ANGB/Duluth, Mn.		SHIP TO ENGINEERING-SCIENCE LABORATORY, INC. 600 Bancroft Way Berkeley, CA. 94710		SOILS ANALYSES REQUIRED							REMARKS
SAMPLER(S): (Signature) <i>John Sherwin</i> <i>Mike Kelly</i>		NO. OF CON- TAINERS		SW 8010, 8020 SW 8080 SW 8270 EPA 418.1 SW 8010, 7191 SW 131, 7421 SW 131, 7421									
DATE	TIME	SAMPLE DESCRIPTION				SW 8010, 8020	SW 8080	SW 8270	EPA 418.1	SW 8010, 7191	SW 131, 7421	SW 131, 7421	
8/24/88	8:10a	DANGB-4 - MW24 SS1		1		X							882039 908
8/24/88	8:10a	DANGB-4 - MW24 SS1		1			X	X					882100
8/24/88	8:20a	DANGB-4 - MW24 SS2		1		X							
8/24/88	8:20a	DANGB 4 - MW24 SS2		1			X	X					
8/24/88	9:30a	DANGB-4 - MW24 SS3		1									
8/24/88	9:30a	DANGB-4 - MW24 SS3		1		X		X					882101
8/24/88	3:38	DANGB-3 - MW27 SS1		1		X							882102 909
8/24/88	3:38	DANGB-3 - MW27 SS1		1			X						
8/24/88	4:10	DANGB-3 - MW27 SS2		1		X							882103
8/24/88	4:10	DANGB-3 - MW27 SS2		1			X	X					
8/24/88	4:32	DANGB-3 - MW27 SS3		1		X							882104
8/24/88	4:32	DANGB-3 - MW27 SS3		1			X						

2348

Relinquished by: (Signature)		Date/Time	Received by: (Signature)		Date/Time
<i>John Sherwin</i>		8/24/88 5:32p			
Relinquished by: (Signature)		Date/Time	Remarks		
<i>Bill Friedman</i>		8-25-88 12:45	Rec'd cold & intact		

DATA PACKAGE #51

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**ENGINEERING-SCIENCE, INC.**600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the soil samples received
by this laboratory on 8-31-88.Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88102192	DANGB3-MW30-SS1	AS-F	8-30-88		10-10-88	
88102192	DANGB3-MW30-SS1	BA-I	8-30-88		10-20-88	
88102192	DANGB3-MW30-SS1	CD-F	8-30-88		10-20-88	
88102192	DANGB3-MW30-SS1	CR-F	8-30-88		10-20-88	
88102192	DANGB3-MW30-SS1	HG-C	8-30-88		9-22-88	
88102192	DANGB3-MW30-SS1	PB-F	8-30-88		10-20-88	
88102192	DANGB3-MW30-SS1	418.1	8-30-88	9-26-88	9-27-88	
88102192	DANGB3-MW30-SS1	MOIS	8-30-88		9-07-88	
88102192	DANGB3-MW30-SS1	8010	8-30-88		9-08-88	9-08-88
88102192	DANGB3-MW30-SS1	8020	8-30-88		9-08-88	9-08-88
88102192	DANGB3-MW30-SS1	8080	8-30-88	9-09-88	10-05-88	
88102193	DANGB3-MW30-SS1A	AS-F	8-30-88		10-10-88	
88102193	DANGB3-MW30-SS1A	BA-I	8-30-88		10-20-88	
88102193	DANGB3-MW30-SS1A	CD-F	8-30-88		10-20-88	
88102193	DANGB3-MW30-SS1A	CR-F	8-30-88		10-20-88	
88102193	DANGB3-MW30-SS1A	HG-C	8-30-88		9-22-88	
88102193	DANGB3-MW30-SS1A	PB-F	8-30-88		10-20-88	
88102193	DANGB3-MW30-SS1A	418.1	8-30-88	9-26-88	9-27-88	
88102193	DANGB3-MW30-SS1A	MOIS	8-30-88		9-07-88	
88102193	DANGB3-MW30-SS1A	8010	8-30-88		9-08-88	9-08-88
88102193	DANGB3-MW30-SS1A	8020	8-30-88		9-08-88	9-08-88
88102193	DANGB3-MW30-SS1A	8080	8-30-88	9-09-88	10-05-88	10-7-88

* If applicable

88-A1-DULU0580 1

CL-FRM01



ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88102194	DANGB3-MW30-SS2	AS-F	8-30-88		10-10-88	
88102194	DANGB3-MW30-SS2	BA-I	8-30-88		10-20-88	
88102194	DANGB3-MW30-SS2	CD-F	8-30-88		10-20-88	
88102194	DANGB3-MW30-SS2	CR-F	8-30-88		10-20-88	
88102194	DANGB3-MW30-SS2	HG-C	8-30-88		9-22-88	
88102194	DANGB3-MW30-SS2	PB-F	8-30-88		10-20-88	
88102194	DANGB3-MW30-SS2	418.1	8-30-88	9-26-88	9-27-88	
88102194	DANGB3-MW30-SS2	MOIS	8-30-88		9-07-88	
88102194	DANGB3-MW30-SS2	8010	8-30-88		9-08-88	9-08-88
88102194	DANGB3-MW30-SS2	8020	8-30-88		9-08-88	9-08-88
88102194	DANGB3-MW30-SS2	8080	8-30-88	9-09-88	10-05-88	
88102195	DANGB3-MW30-SS3	AS-F	8-30-88		10-10-88	
88102195	DANGB3-MW30-SS3	BA-I	8-30-88		10-20-88	
88102195	DANGB3-MW30-SS3	CD-F	8-30-88		10-20-88	
88102195	DANGB3-MW30-SS3	CR-F	8-30-88		10-20-88	
88102195	DANGB3-MW30-SS3	HG-C	8-30-88		9-22-88	
88102195	DANGB3-MW30-SS3	PB-F	8-30-88		10-20-88	
88102195	DANGB3-MW30-SS3	418.1	8-30-88	9-26-88	9-27-88	
88102195	DANGB3-MW30-SS3	MOIS	8-30-88		9-07-88	
88102195	DANGB3-MW30-SS3	8010	8-30-88		9-08-88	9-08-88
88102195	DANGB3-MW30-SS3	8020	8-30-88		9-08-88	9-09-88
88102195	DANGB3-MW30-SS3	8080	8-30-88	9-09-88	10-05-88	
88102196	DANGB3-MW29-SS1	AS-F	8-30-88		10-10-88	
88102196	DANGB3-MW29-SS1	BA-I	8-30-88		10-20-88	
88102196	DANGB3-MW29-SS1	CD-F	8-30-88		10-20-88	
88102196	DANGB3-MW29-SS1	CR-F	8-30-88		10-20-88	
88102196	DANGB3-MW29-SS1	HG-C	8-30-88		9-22-88	
88102196	DANGB3-MW29-SS1	PB-F	8-30-88		10-20-88	
88102196	DANGB3-MW29-SS1	418.1	8-30-88	9-26-88	9-27-88	
88102196	DANGB3-MW29-SS1	MOIS	8-30-88		9-07-88	
88102196	DANGB3-MW29-SS1	8010	8-30-88		9-08-88	9-08-88
88102196	DANGB3-MW29-SS1	8020	8-30-88		9-08-88	9-09-88
88102196	DANGB3-MW29-SS1	8080	8-30-88	9-09-88	10-05-88	10-07-88

* If applicable

88-A1-DULU0580 2

CL-FRM01



ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88102197	DANGB3-MW29-SS2	AS-F	8-30-88		10-10-88	
88102197	DANGB3-MW29-SS2	BA-I	8-30-88		10-20-88	
88102197	DANGB3-MW29-SS2	CD-F	8-30-88		10-20-88	
88102197	DANGB3-MW29-SS2	CR-F	8-30-88		10-20-88	
88102197	DANGB3-MW29-SS2	HG-C	8-30-88		9-22-88	
88102197	DANGB3-MW29-SS2	PB-F	8-30-88		10-20-88	
88102197	DANGB3-MW29-SS2	418.1	8-30-88	9-26-88	9-27-88	
88102197	DANGB3-MW29-SS2	MOIS	8-30-88		9-07-88	
88102197	DANGB3-MW29-SS2	8010	8-30-88		9-08-88	9-09-88
88102197	DANGB3-MW29-SS2	8020	8-30-88		9-08-88	9-09-88
88102197	DANGB3-MW29-SS2	8080	8-30-88	9-09-88	10-05-88	10-07-88
88102198	DANGB3-MW29-SS3	AS-F	8-30-88		10-10-88	
88102198	DANGB3-MW29-SS3	BA-I	8-30-88		10-20-88	
88102198	DANGB3-MW29-SS3	CD-F	8-30-88		10-20-88	
88102198	DANGB3-MW29-SS3	CR-F	8-30-88		10-20-88	
88102198	DANGB3-MW29-SS3	HG-C	8-30-88		9-22-88	
88102198	DANGB3-MW29-SS3	PB-F	8-30-88		10-20-88	
88102198	DANGB3-MW29-SS3	418.1	8-30-88	9-26-88	9-27-88	
88102198	DANGB3-MW29-SS3	MOIS	8-30-88		9-07-88	
88102198	DANGB3-MW29-SS3	8010	8-30-88		9-08-88	9-09-88
88102198	DANGB3-MW29-SS3	8020	8-30-88		9-08-88	9-09-88
88102198	DANGB3-MW29-SS3	8080	8-30-88	9-09-88	10-05-88	
88102199	DANGB3-MW29-SS3A	AS-F	8-30-88		10-10-88	
88102199	DANGB3-MW29-SS3A	BA-I	8-30-88		10-20-88	
88102199	DANGB3-MW29-SS3A	CD-F	8-30-88		10-20-88	
88102199	DANGB3-MW29-SS3A	CR-F	8-30-88		10-20-88	
88102199	DANGB3-MW29-SS3A	HG-C	8-30-88		9-22-88	
88102199	DANGB3-MW29-SS3A	PB-F	8-30-88		10-20-88	
88102199	DANGB3-MW29-SS3A	418.1	8-30-88	9-26-88	9-27-88	
88102199	DANGB3-MW29-SS3A	MOIS	8-30-88		9-07-88	
88102199	DANGB3-MW29-SS3A	8010	8-30-88		9-08-88	9-08-88
88102199	DANGB3-MW29-SS3A	8020	8-30-88		9-08-88	9-09-88
88102199	DANGB3-MW29-SS3A	8080	8-30-88	9-09-88	10-05-88	

* If applicable



ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88102200	DANGB3-SGD3-SS1	AS-F	8-30-88		10-10-88	
88102200	DANGB3-SGD3-SS1	BA-I	8-30-88		10-20-88	
88102200	DANGB3-SGD3-SS1	CD-F	8-30-88		10-20-88	
88102200	DANGB3-SGD3-SS1	CR-F	8-30-88		10-20-88	
88102200	DANGB3-SGD3-SS1	HG-C	8-30-88		9-22-88	
88102200	DANGB3-SGD3-SS1	PB-F	8-30-88		10-20-88	
88102200	DANGB3-SGD3-SS1	418.1	8-30-88	9-26-88	9-27-88	
88102200	DANGB3-SGD3-SS1	MOIS	8-30-88		9-07-88	
88102200	DANGB3-SGD3-SS1	8010	8-30-88		9-08-88	9-08-88
88102200	DANGB3-SGD3-SS1	8020	8-30-88		9-08-88	9-09-88
88102200	DANGB3-SGD3-SS1	8080	8-30-88	9-09-88	10-05-88	
88102201	DANGB3-SGD3-SS1A	AS-F	8-30-88		10-10-88	
88102201	DANGB3-SGD3-SS1A	BA-I	8-30-88		10-20-88	
88102201	DANGB3-SGD3-SS1A	CD-F	8-30-88		10-20-88	
88102201	DANGB3-SGD3-SS1A	CR-F	8-30-88		10-20-88	
88102201	DANGB3-SGD3-SS1A	HG-C	8-30-88		9-22-88	
88102201	DANGB3-SGD3-SS1A	PB-F	8-30-88		10-20-88	
88102201	DANGB3-SGD3-SS1A	418.1	8-30-88	9-26-88	9-27-88	
88102201	DANGB3-SGD3-SS1A	MOIS	8-30-88		9-07-88	
88102201	DANGB3-SGD3-SS1A	8010	8-30-88		9-08-88	9-09-88
88102201	DANGB3-SGD3-SS1A	8020	8-30-88		9-08-88	9-09-88
88102201	DANGB3-SGD3-SS1A	8080	8-30-88	9-09-88	10-05-88	
88102202	DANGB3-3SG3-SS1	AS-F	8-30-88		10-10-88	
88102202	DANGB3-3SG3-SS1	BA-I	8-30-88		10-20-88	
88102202	DANGB3-3SG3-SS1	CD-F	8-30-88		10-20-88	
88102202	DANGB3-3SG3-SS1	CR-F	8-30-88		10-20-88	
88102202	DANGB3-3SG3-SS1	HG-C	8-30-88		9-22-88	
88102202	DANGB3-3SG3-SS1	PB-F	8-30-88		10-20-88	
88102202	DANGB3-3SG3-SS1	418.1	8-30-88	9-26-88	9-27-88	
88102202	DANGB3-3SG3-SS1	MOIS	8-30-88		9-07-88	
88102202	DANGB3-3SG3-SS1	8010	8-30-88		9-08-88	9-09-88
88102202	DANGB3-3SG3-SS1	8020	8-30-88		9-08-88	9-09-88
88102202	DANGB3-3SG3-SS1	8080	8-30-88	9-09-88	10-05-88	

* If applicable



ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88102203	DANGB3-3SG3-SS1A	AS-F	8-30-88		10-10-88	
88102203	DANGB3-3SG3-SS1A	BA-I	8-30-88		10-20-88	
88102203	DANGB3-3SG3-SS1A	CD-F	8-30-88		10-20-88	
88102203	DANGB3-3SG3-SS1A	CR-F	8-30-88		10-20-88	
88102203	DANGB3-3SG3-SS1A	HG-C	8-30-88		9-22-88	
88102203	DANGB3-3SG3-SS1A	PB-F	8-30-88		10-20-88	
88102203	DANGB3-3SG3-SS1A	418.1	8-30-88	9-26-88	9-27-88	
88102203	DANGB3-3SG3-SS1A	MOIS	8-30-88		9-07-88	
88102203	DANGB3-3SG3-SS1A	8010	8-30-88		9-08-88	9-09-88
88102203	DANGB3-3SG3-SS1A	8020	8-30-88		9-08-88	9-09-88
88102203	DANGB3-3SG3-SS1A	8080	8-30-88	9-09-88	10-05-88	

3SGE3

* If applicable

88-A1-DULU0580 5

CL-FRM01

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88102192-88102203
WORK ORDER NO.: 932

These soil samples were received at the ES Berkeley Laboratory
on 8-31-88. They were received cold and intact.

11/08/88

ANALYSIS REPORT

WORK ORDER NUMBER: 932
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/02/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 2, UNITS: MG/KG

	DANB3-MW30-SS1	DANB3-MW30-SS1A	DANB3-MW30-SS2	DANB3-MW30-SS3	DANB3-MW29-SS1	DANB3-MW29-SS2
TEST COMPOUND	88102192	88102193	88102194	88102195	88102196	88102197
-----	-----	-----	-----	-----	-----	-----
CID DIG SOIL	NA	NA	NA	NA	NA	NA
ARSENIC	<5.0NE	<5.0NE	<5.0NE	<5.0NE	<5.0NE	<5.0NE
BARIUM	64.0	58.3	45.1	32.2	58.6	43.2
CADMIUM	7.2N	10.8N	9.4N	6.1N	7.5N	7.4N
CHROMIUM	30.4	41.0	34.1	21.5	36.2	27.6
MERCURY	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
LEAD	4.5N	5.3N	7.1N	3.5N	5.8N	8.2N

A -- Not Analyzed

ND - Not Detected

2757

ANALYSIS REPORT FOR WORK ORDER NUMBER 932

SK: 2, UNITS: MG/KG

	DANGB3-MW29-SS3	DANGB3-MW29-SS3A	DANGB3-SGD3-SS1	DANGB3-SGD3-SS1A	DANGB3-3SG3-SS1	DANGB3-3SG3-SS1A
TEST COMPOUND	88102198	88102199	88102200	88102201	88102202	88102203
-----	-----	-----	-----	-----	-----	-----
ID DIG SOIL	NA	NA	NA	NA	NA	NA
SENIC	<5.0NE	<5.0NE	<5.0NE	<5.0NE	<5.0NE	<5.0NE
RIUM	31.8	34.7	55.8	58.8	55.7	68.0
OMIUM	7.6N	7.1N	7.4N	9.2N	9.9N	10.7N
ROMIUM	25.3	26.0	31.8	42.8	31.0	27.9
RCURY	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
AD	4.3N	3.4N	4.1N	5.0N	4.2N	4.1N

- Not Analyzed
- Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 932
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/02/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
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710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

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710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 3, UNITS: mg/Kg

	DANB3-MW30-SS1	DANB3-MW30-SS1A	DANB3-MW30-SS2	DANB3-MW30-SS3	DANB3-MW29-SS1	DANB3-MW29-SS2
TEST COMPOUND	88102192	88102193	88102194	88102195	88102196	88102197
18.1 PETROLEUM HYDROCARBONS	<100	<100	<100	<100	<100	<100
% MOISTURE	7.8	7.7	8.3	10.5	9.6	9.8

ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 932

SK: 3, UNITS: mg/Kg

	DANGB3-MW29-SS3	DANGB3-MW29-SS3A	DANGB3-SGD3-SS1	DANGB3-SGD3-SS1A	DANGB3-3SG3-SS1	DANGB3-3SG3-SS1A
ST COMPOUND	88102198	88102199	88102200	88102201	88102202	88102203
8.1 PETROLEUM HYDROCARBONS	<100	<100	<100	<100	<100	<100
MOISTURE	11.4	12.7	8.1	7.9	9.5	9.3

- Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 932
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/02/88

APPROVED BY _____
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

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OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: UG/KG, GROUP 8010

	DANB3-MW30-SS1	DANB3-MW30-SS1A	DANB3-MW30-SS2	DANB3-MW30-SS3	DANB3-MW29-SS1	DANB3-MW29-SS2
TEST COMPOUND	88102192	88102193	88102194	88102195	88102196	88102197
ENZYL CHLORIDE	ND	ND	ND	ND	ND	ND
IS (2-CHLOROETHOXY)METHANE	ND	ND	ND	ND	ND	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND	ND	ND	ND	ND	ND
BROMOBENZENE	ND	ND	ND	ND	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND	ND	ND	ND
BROMOFORM	ND	ND	ND	ND	ND	ND
BROMOETHANE	ND	ND	ND	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND	ND	ND	ND
CHLORACETALDEHYDE	ND	ND	ND	ND	ND	ND
CHLORAL	ND	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND
CHLOROETHANE	ND	ND	ND	ND	ND	ND
CHLOROFORM	ND	ND	ND	ND	ND	ND
1-CHLOROHEXANE	ND	ND	ND	ND	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND	ND	ND	ND	ND
CHLOROMETHANE	ND	ND	ND	ND	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND	ND	ND	ND	ND
CHLOROTOLUENE	ND	ND	ND	ND	ND	ND
IBROMOCHLOROMETHANE	ND	ND	ND	ND	ND	ND
IBROMOMETHANE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
DICHLOROMETHANE	1.2B	1.3B	ND	1.2B	0.94B	0.57B
1,2-DICHLOROPROPANE	ND	ND	ND	ND	ND	ND

ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 932

	DANGB3-MW30-SS1	DANGB3-MW30-SS1A	DANGB3-MW30-SS2	DANGB3-MW30-SS3	DANGB3-MW29-SS1	DANGB3-MW29-SS2
ST COMPOUND	88102192	88102193	88102194	88102195	88102196	88102197
3-DICHLOROPROPYLENE	ND	ND	ND	ND	ND	ND
1,2,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
TRACHLOROETHYLENE	ND	ND	ND	ND	ND	ND
1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,2-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
ICHLOROETHYLENE	ND	ND	ND	ND	0.74	3.1
ICHLOROFLUOROMETHANE	ND	ND	ND	ND	ND	ND
ICHLOROPROPANE	ND	ND	ND	ND	ND	ND
NYL CHLORIDE	ND	ND	ND	ND	ND	ND

- Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 932

TASK: 4, UNITS: UG/KG, GROUP 8010

	DANGB3-MW29-SS3	DANGB3-MW29-SS3A	DANGB3-SGD3-SS1	DANGB3-SGD3-SS1A	DANGB3-3SG3-SS1	DANGB3-3SG3-SS1A
TEST COMPOUND	88102198	88102199	88102200	88102201	88102202	88102203
BENZYL CHLORIDE	ND	ND	ND	ND	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND	ND	ND	ND	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND	ND	ND	ND	ND	ND
BROMOBENZENE	ND	ND	ND	ND	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND	ND	ND	ND
BROMOFORM	ND	ND	ND	ND	ND	ND
BROMOETHANE	ND	ND	ND	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND	ND	ND	ND
CHLORACETALDEHYDE	ND	ND	ND	ND	ND	ND
CHLORAL	ND	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND
CHLOROETHANE	ND	ND	ND	ND	ND	ND
CHLOROFORM	ND	ND	ND	ND	ND	ND
1-CHLOROHXANE	ND	ND	ND	ND	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND	ND	ND	ND	ND
CHLOROMETHANE	ND	ND	ND	ND	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND	ND	ND	ND	ND
CHLOROTOLUENE	ND	ND	ND	ND	ND	ND
DIBROMOCHLOROMETHANE	ND	ND	ND	ND	ND	ND
DIBROMOMETHANE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
DICHLOROMETHANE	ND	0.67B	1.5B	2.2B	5.4B	8.1B
1,2-DICHLOROPROPANE	ND	ND	ND	ND	ND	ND
1,3-DICHLOROPROPYLENE	ND	ND	ND	ND	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1,1,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
TETRACHLOROETHYLENE	ND	0.41	ND	ND	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
TRICHLOROFLUOROMETHANE	ND	ND	ND	ND	ND	ND
TRICHLOROPROPANE	ND	ND	ND	ND	ND	ND
VINYL CHLORIDE	ND	ND	ND	ND	ND	ND

ND - Not Detected

ANALYSIS REPORT

RK ORDER NUMBER: 932
B NUMBER : ZB0000000440
RK ORDER DATE : 09/02/88

APPROVED BY _____
Lab Supervisor

PORT DATA:
OAK RIDGE/DULUTH ANGB
O S. ILLINOIS AVE. STE. S103
K RIDGE, TN 37830
LL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

NTRACT / PO # : OR001
NTACT : BILL HAYDEN
(615)-481-3920

SK: 4, UNITS: UG/KG, GROUP 8020

	DANGB3-MW30-SS1	DANGB3-MW30-SS1A	DANGB3-MW30-SS2	DANGB3-MW30-SS3	DANGB3-MW29-SS1	DANGB3-MW29-SS2
ST COMPOUND	88102192	88102193	88102194	88102195	88102196	88102197
NZENE	ND	ND	ND	ND	ND	ND
LOROBENZENE	ND	ND	ND	ND	ND	ND
2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
HYL BENZENE	ND	ND	ND	ND	ND	ND
LUENE	ND	ND	ND	20	18	38
LENES	ND	ND	ND	ND	ND	ND

- Not Detected

11/08/88

ANALYSIS REPORT FOR WORK ORDER NUMBER 932

TASK: 4, UNITS: UG/KG, GROUP 8020

	DANGB3-MW29-SS3	DANGB3-MW29-SS3A	DANGB3-SGD3-SS1	DANGB3-SGD3-SS1A	DANGB3-3SG3-SS1	DANGB3-3SG3-SS1A
TEST COMPOUND	88102198	88102199	88102200	88102201	88102202	88102203
BENZENE	ND	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
ETHYL BENZENE	ND	ND	ND	ND	ND	ND
TOLUENE	7.0	7.1	44	23	8.8	22
XYLENES	ND	ND	ND	ND	ND	ND

ND - Not Detected

2765

ANALYSIS REPORT

RK ORDER NUMBER: 932
B NUMBER : ZB0000000440
RK ORDER DATE : 09/02/88

APPROVED BY _____
Lab Supervisor

PORT DATA:
OAK RIDGE/DULUTH ANGB
0 S. ILLINOIS AVE. STE. S103
K RIDGE, TN 37830
LL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

NTRACT / PO # : OR001
NTACT : BILL HAYDEN
(615)-481-3920

SK: 4, UNITS: UG/KG, GROUP 8080

	DANGB3-MW30-SS1	DANGB3-MW30-SS1A	DANGB3-MW30-SS2	DANGB3-MW30-SS3	DANGB3-MW29-SS1	DANGB3-MW29-SS2
ST COMPOUND	88102192	88102193	88102194	88102195	88102196	88102197
DRIN	ND	ND	ND	ND	ND	ND
PHA-BHC	ND	ND	ND	ND	ND	ND
TA-BHC	ND	ND	ND	ND	ND	ND
LTA-BHC	ND	ND	ND	ND	ND	ND
MMA-BHC	ND	ND	ND	ND	ND	ND
LORDANE	ND	ND	ND	ND	ND	ND
4'-DDD	ND	ND	ND	ND	ND	ND
4'-DDE	ND	ND	ND	ND	ND	ND
4'-DDT	ND	ND	ND	ND	ND	22
ELDRIN	ND	ND	ND	ND	ND	ND
DOSULFAN I	ND	ND	ND	ND	ND	ND
DOSULFAN II	ND	ND	ND	ND	ND	ND
DOSULFAN SULFATE	ND	ND	ND	ND	ND	ND
DRIN	ND	ND	ND	ND	ND	ND
DRIN ALDEHYDE	NA	NA	NA	NA	NA	NA
PTACHLOR	ND	ND	ND	ND	ND	ND
PTACHLOR EPOXIDE	ND	ND	ND	ND	ND	ND
PONE	NA	NA	NA	NA	NA	NA
THOXYCHLOR	ND	ND	ND	ND	ND	ND
XAPHENE	ND	ND	ND	ND	ND	ND
B-1016	ND	ND	ND	ND	ND	ND
B-1221	ND	ND	ND	ND	ND	ND
B-1232	ND	ND	ND	ND	ND	ND
B-1242	ND	ND	ND	ND	ND	ND
B-1248	ND	ND	ND	ND	ND	ND
B-1254	ND	ND	ND	ND	ND	ND
B-1260	ND	ND	ND	ND	ND	ND

- Not Analyzed
- Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 932

TASK: 4, UNITS: UG/KG, GROUP 8080

	DANGB3-MW29-SS3	DANGB3-MW29-SS3A	DANGB3-SGD3-SS1	DANGB3-SGD3-SS1A	DANGB3-3SG3-SS1	DANGB3-3SG3-SS1A
TEST COMPOUND	88102198	88102199	88102200	88102201	88102202	88102203
ALDRIN	ND	ND	ND	ND	ND	ND
ALPHA-BHC	ND	ND	ND	ND	ND	ND
BETA-BHC	ND	ND	ND	ND	ND	ND
DELTA-BHC	ND	ND	ND	ND	ND	ND
GAMMA-BHC	ND	ND	ND	ND	ND	ND
CHLORDANE	ND	ND	ND	ND	ND	ND
4,4'-DDD	ND	ND	ND	ND	ND	ND
4,4'-DDE	ND	ND	ND	ND	ND	ND
4,4'-DDT	ND	ND	ND	ND	ND	ND
DIELDRIN	ND	ND	ND	ND	ND	ND
ENDOSULFAN I	ND	ND	ND	ND	ND	ND
ENDOSULFAN II	ND	ND	ND	ND	ND	ND
ENDOSULFAN SULFATE	ND	ND	ND	ND	ND	ND
ENDRIN	ND	ND	ND	ND	ND	ND
ENDRIN ALDEHYDE	NA	NA	NA	NA	NA	NA
HEPTACHLOR	ND	ND	ND	ND	ND	ND
HEPTACHLOR EPOXIDE	ND	ND	ND	ND	ND	ND
KEPONE	NA	NA	NA	NA	NA	NA
METHOXYCHLOR	ND	ND	ND	ND	ND	ND
OXAPHENE	ND	ND	ND	ND	ND	ND
PCB-1016	ND	ND	ND	ND	ND	ND
PCB-1221	ND	ND	ND	ND	ND	ND
CB-1232	ND	ND	ND	ND	ND	ND
CB-1242	ND	ND	ND	ND	ND	ND
PCB-1248	ND	ND	ND	ND	ND	ND
PCB-1254	ND	ND	ND	ND	ND	ND
CB-1260	ND	ND	ND	ND	ND	ND

NA - Not Analyzed

ND - Not Detected

CHAIN OF CUSTODY RECORD 932-1

10/20

S JOB NO. OR001	PROJECT NAME/LOCATION Duluth ANGB/Duluth, Mn.	DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	SOILS ANALYSES REQUIRED						SHIP TO: ENGINEERING-SCIENCE LABORATORY, INC. 600 Bancroft V. Berkeley, CA. 94704
						SW8010, 8020	SW8080	SW8270	EPA 418.1	SW8010, 7060, 7191	SW7131, 7421, 7471	
9/30/88		1110		DANGB 3 MW30 SS 1	1	X						882192
		1110		DANGB 3 MW30 SS 1	1	X	X	X				
		1112		DANGB 3 MW30 SS 1A	1	X						882193
		1112		DANGB 3 MW30 SS 1A	1	X	X	X				
		1124		DANGB 3 MW30 SS 2	1	X						882194
		1124		DANGB 3 MW30 SS 2	1	X	X	X				
		1130		DANGB 3 MW30 SS 3	1	X						882195
		1130		DANGB 3 MW30 SS 3	1	X	X	X				
		0940		DANGB 3 MW29 SS 1	1	X						882196
		0940		DANGB 3 MW29 SS 1	1	X	X	X				
		0955		DANGB 3 MW29 SS 2	1	X						882197
		0955		DANGB 3 MW29 SS 2	1	X	X	X				
		1000		DANGB 3 MW29 SS 3	1	X						882198
		1000		DANGB 3 MW29 SS 3	1	X	X	X				
		1007		DANGB 3 MW29 SS 3A	1	X						882199

Received by: (Signature) *[Signature]* Date/Time 9/30/88 1730

Relinquished by: (Signature) _____ Date/Time _____

Remarks: rec'd cold & intact

Received for Laboratory by: (Signature) *[Signature]* Date/Time 9/31/88 12:00

Remarks: _____

2012

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

QUALITY CONTROL RESULTS SUMMARY METALS

Job No.: OR001
 Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830

QC Report No: ICP-S-0034-88
 Sample Matrix: Soil
 Conc. Unit: mg/KG
 Date Received: 8-29-88
 Date Reported: 10-28-88
 Dilution Factor: NA
 %Moisture: 19.0

Project: Duluth ANGB
 QC Report for Laboratory Sample No(s):
 88082156-88082163, 88082186-88082188
 88082192-88082199

Laboratory Supervisor Approval:
[Signature]

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	C1	Duplicate		RPD	SA	Spike Recovery		PR	Notes
								C2				SR	SSR		
Barium	88082156	88082156	10-20-88	10-11-88	SW6010	<20	69.5	63.4	9		247	69.5	333	107	
Cadmium	88082156	88082156	10-20-88	10-11-88	SW5010	<0.5	7.5	7.2	4		6.2	7.5	10.6	50N	
Chromium	88082156	88082156	10-20-88	10-11-88	SW6010	<1.0	38.3	36.5	5		24.7	38.3	57.8	79	
Lead	88062156	88082156	10-22-88	10-11-88	SW6010	<10	11.6	<10	NC		61.7	11.6	65.6	88	A

2770

2770

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

A See Case Narrative attached.
 N See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$
 NA = Not Applicable
 NC = Not Calculated
 ND = Not Detected

Percent Recovery (PR) = $\frac{SSR - SR \times 100}{SA}$
 SSR = Spiked Sample Result
 SR = Sample Result
 SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY METALS

Job No.: OR001 ICP-S-0033-88
 Client: ES Oak Ridge Soil
 Attn: Bill Hayden mg/KG
 Address: 710 S. Illinois Avenue 8-31-88
 Suite F-103 10-28-88
 Oak Ridge, Tn. 37830 NA
 QC Report No: 8.1
 Sample Matrix: 8.1
 Conc. Unit: 8.1
 Date Received: 8.1
 Date Reported: 8.1
 Dilution Factor: 8.1
 %Moisture: 8.1

Project: Duluth ANGB Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
 88082200-88082203, 88092223-88092227
 88092244-88092246, 88092248-88092249
 88092252-88092255

Analyte	Laboratory Duplicates	Sample Nos.	Date Anal	Date Prep	Anal Method	Blank	C1	C2	RPD	SA	SR	SSR	PR	Notes
Barium	88082200	88082200	10-20-88	10-18-88	SW6010	<20	55.8	52.6	7	218	55.8	254	91	
Cadmium	88082200	88082200	10-20-88	10-18-88	SW6010	<0.5	7.4	8.7	16	5.4	7.4	11.0	67N	
Chromium	88082200	88082200	10-20-88	10-18-88	SW6010	<1.0	31.8	37.3	16	21.8	31.8	56.7	114	
Lead	88082200	88082200	10-20-88	10-18-88	SW6010	<10	<10	<10	NC	54.4	<10	49.2	90	A

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
 A Sample results for lead are reported from Furnace analyses for the following
 Sample No(s): 88082200-88082203, 88082244, 88092248-88092249, 88092252, 88092255.
 N See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$ NA = Not Applicable
 C1 = Concentration One NC = Not Calculated
 C2 = Concentration Two ND = Not Detected

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$ SSR = Spiked Sample Result
 SR = Sample Result
 SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY METALS

Job No.: OR001
 Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830

QC Report No: AAF-S-0033-88
 Sample Matrix: Soil
 Conc. Unit: mg/KG
 Date Received: 8-31-88
 Date Reported: 10-28-88
 Dilution Factor: See Notes
 %Moisture: 7.8

Project: Duluth ANGB
 Laboratory Supervisor Approval: *[Signature]*

QC Report for Laboratory Sample No(s):
 88082192-88082203, 88082099, 88082101
 88082130

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	C1	Duplicate C2	RPD	SA	Spike Recovery SR	SSR	PR	Notes
Arsenic	88082192	88082192	10-10-88	9-29-88	7060	<0.5	<5.0E	<5.0E	NC	4.34	0.76E	9.0	190N	DF=10
Lead	88082192	88082192	10-20-88	9-29-88	7421	<0.5	4.3	4.3	0	5.42	4.3	15.7	210N	DF=NA

2772

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
 N See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$
 C1 = Concentration One
 C2 = Concentration Two
 NA = Not Applicable
 NC = Not Calculated
 ND = Not Detected

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$
 SSR = Spiked Sample Result
 SR = Sample Result
 SA = Spike Added (Concentration)

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88082192-88082203

As a result of extreme sample matrix interference, dilution was required for sample analysis. The reporting limit and MDL for the analyte(s) listed have increased as shown.

<u>Analyte</u>	<u>Reporting Limit</u>	<u>MDL</u>
Arsenic	10 mg/Kg	5.0 mg/Kg

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

QC Report No: TPH-S-0081-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-31-88
Date Prepared: 9-26-88
Date Analyzed: 9-27-88
Date Reported: 11-22-88
Dilution Factor: 8
%Moisture: 7.8

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn.

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88082192-88082203, 88082186-88082188

AWB

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88082192	418.1	<100	<100	1100	760	69	730	66	4	*
Blank	418.1	<100	<100	1000	700	70	800	80	13	*

2774

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

* Percent recovery and relative percent difference are within ES Laboratory limits for matrix spike and blank spike.

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

MS = Spike Sample
MSD = Spike Duplicate

SR = Sample Result
SA = Spike Added (Concentration)

Percent Recovery (PR) = $\frac{SSR - SR \times 100}{SA}$

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: VGC-S-0057-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 8-30-88
Date Prepared: NA
Date Analyzed: 9-12-88
Date Reported: 10-31-88
Dilution Factor: NA
% Moisture: 12.7

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s).:
88082186-88082188
88082192-88082202

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
88082199	Halocarbons: 8010									
	1,1-dichloroethane	11.5	ND	11.1	97	11.1	97	0	20	58-124
	Trichloroethene	11.5	ND	14.3	*124	12.9	*112*	10	16	75-110
	Chlorobenzene	11.5	ND	15.2	*132	15.2	*132	0	21	71-125
88082199	Aromatics: 8020									
	Benzene	11.5	ND	15.2	*132	14.5	*126	5	26	75-123
	Toluene	11.5	0.99	15.2	*124	14.3	*116	6	16	79-115
	Chlorobenzene	11.5	ND	15.0	*130	14.5	*126	3	24	82-112

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* See Case Narrative attached.

$$\text{Relative Percent Difference (PR)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(\text{MS or MSD}) - \text{SR} \times 100}{\text{SA}}$$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)
NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: VGC-S-0057-88B
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: NA
Date Prepared: NA
Date Analyzed: 9-12-88
Date Reported: 10-31-88
Dilution Factor: NA
% Moisture: NA

Project: Duluth ANGB
Laboratory Supervisor Approval: *[Signature]*

QC Report for Laboratory Sample No(s):
88082186-88082188
88082192-88082202

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
Blank	Halocarbons: 8010									
	1,1-dichloroethane	10	ND	9.19	92	10.3	103	11	20	53-124
	Trichloroethene	10	ND	8.89	88	9.59	96	8	16	75-110
	Chlorobenzene	10	ND	9.24	92	9.39	94	2	21	71-125
Blank	Aromatics: 8020									
	Benzene	10	ND	8.91	89	9.37	94	5	26	75-123
	Toluene	10	ND	8.83	88	9.61	96	8	16	79-115
	Chlorobenzene	10	ND	8.78	88	9.39	94	7	24	82-112

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

$$\text{Relative Percent Difference (PR)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(\text{MS or MSD}) - \text{SR}}{\text{SA}} \times 100$$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO(S).: VGC-S-0057-88
QC REPORT NO(S).: VGC-S-0057-88B

Percent recoveries exceed the ES Laboratory limits. A blank spike analysis shows the laboratory to be in control.

METHOD BLANK SUMMARY

Job No:	OR001	Sample Matrix:	Soil
Client:	ES Oak Ridge	Conc. Unit:	ug/Kg
Attn:	Bill Hayden	Date Reported:	10-31-88
Address:	710 S. Illinois Avenue		
	Suite F-103		
	Oak Ridge, Tn. 37830		
Project:	Duluth ANGB	Laboratory Supervisor Approval:	

File ID	Date Analyzed	Fraction	Instru- ment ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
12	9-08-88	VGC	Carbopack	75-09-2	Dichloromethane	0.89	0.25	88082192-88082203
				67-66-3	Chloroform	0.89	0.05	
				1130-20-7	Xylene	0.77	0.4	
2778								

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No.: OCP-S-0033-88
QC Sample No.: 88082193
Level (Low/Med): Low
Date Reported: 11-02-88

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88082192-88082203
88082244-88082249



Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2170	ND	60.7	84	46-127
Heptachlor	2170	ND	57.1	79	35-130
Aldrin	2170	ND	63.0	87	34-132
Dieldrin	5420	ND	182	101	31-134
Endrin	5420	ND	101	56	42-139
4,4'-DDT	5420	ND	202	112	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits RPD REC
Lindane	64.8	90	84	7	50 46-127
Heptachlor	63.6	88	79	11	31 35-130
Aldrin	66.1	91	87	5	43 34-132
Dieldrin	194	107	101	6	38 31-134
Endrin	175	97	56	54*	45 42-139
4,4'-DDT	210	116	112	4	50 23-134

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: 1 out of 6 outside limits

Spike Recovery: 0 out of 12 outside limits

2779

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No.: OCP-S-0033-88B
QC Sample No.: Blank
Level (Low/Med): Low
Date Reported: 11-02-88

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88082192-88082203
88082244-88082249

[Signature]

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2000	ND	68.4	103	46-127
Heptachlor	2000	ND	65.0	97	35-130
Aldrin	2000	ND	69.3	104	34-132
Dieldrin	5000	ND	200	120	31-134
Endrin	5000	ND	123	74	42-139
4,4'-DDT	5000	ND	157	94	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits	
					RPD	REC
Lindane	65.4	98	103	4	50	46-127
Heptachlor	62.3	94	97	4	31	35-130
Aldrin	69.0	103	104	<1	43	34-132
Dieldrin	193	116	120	4	38	31-134
Endrin	173	103	74	34	45	42-139
4,4'-DDT	152	91	94	3	50	23-134

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: 0 out of 6 outside limits

Spike Recovery: 0 out of 12 outside limits

2780

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO.: OCP-W-0033-88
QC REPORT NO.: OCP-W-0033-88B

Relative percent difference for endrin exceed the EPA guideline in the matrix spike sample. A blank spike analysis shows the laboratory to be in control.

Heptachlor epoxide was inadvertently used instead of heptachlor in the matrix spiking solution.

Endrin aldehyde and Kepone were not recoverable because they were removed by the alumina column clean-up used on these samples.

2

Lab Name: Engineering Science
Lab Sample No.: Blank

Matrix: Soil
Level (low/med): Low
Extraction-
(SepF/Cont/Sonc): Sonc

Date Extracted: 9-09-88
Date Analyzed (1): 10-05-88
Time Analyzed (1): 11:26
Instrument ID (1): 5890 #2
GG Column ID (1): OV-1

Date Analyzed (2): 10-06-88
Time Analyzed (2): 23:52
Instrument ID (2): 5890 #2
GC Column ID (2): Mixed

EPA Sample No.	Lab Sample ID (1)	Date Analyzed 1	Lab Sample ID (2)	Date Analyzed 2
-	88082192	10-05-88	88082193	10-07-88
-	88082193	10-05-88	88082197	10-07-88
-	88082194	10-05-88	88082246	10-07-88
-	88082195	10-05-88	88082247	10-07-88
-	88082196	10-05-88		
-	88082197	10-05-88		
-	88082198	10-05-88		
-	88082199	10-05-88		
-	88082200	10-05-88		
-	88082201	10-05-88		
-	88082202	10-05-88		
-	88082203	10-05-88		
-	88082244	10-16-88		
-	88082245	10-16-88		
-	88082246	10-16-88		
-	88082247	10-16-88		
-	88082248	10-16-88		
-	88082249	10-16-88		

ATILE CONTINUING CALIBRATION CHECK

Name: _____ Contract: _____

Code: _____ Case No.: _____ SAS No.: _____

Instrument ID: carbopak _____ Calibration Date(s): 9/8/88

LAB FILE ID: 10,11 _____ Init. Calib. Date(s): 9/2/88, 9/2/88

COMPOUND	RRF	RRF50	%D
benzyl chloride	0.08		100.00
anis (2-chloroethoxy)			
ethane	0.04		100.00
is (2-chloroisopropyl)			
ether	0.26		100.00
monobenzene	1.17	1.11	100.00
monodichloromethane	4.54	3.94	100.00
monoform	3.48	2.99	100.00
monomethane	0.38	0.10	100.00
carbon tetrachloride	4.58	4.31	100.00
chloroacetaldehyde	ERR		ERR
chlorobenzene	1.48	1.57	100.00
chloroethane	0.58	0.48	100.00
chloroform	4.89	4.37	100.00
-chlorohexane	1.02	0.98	100.00
-chloroethyl vinyl ether	0.04		100.00
chloromethane	0.49	0.39	100.00
chloromethyl methyl ether	0.17		100.00
,m,& p_chlorotoluenes	4.06	4.06	100.00
bromochloromethane	5.29	3.77	100.00
bromomethane	3.56	2.31	100.00
,2_Dichlorobenzene	2.72	2.72	100.00
,3_Dichlorobenzene	2.42	2.35	100.00
,4_Dichlorobenzene	2.36	2.29	100.00
trichlorodifluoromethane	0.54		100.00
,1_Dichloroethane	2.58	2.22	100.00
,2_Dichloroethane	3.23	2.92	100.00
,1_Dichloroethylene	2.79	2.46	100.00
trans_1,2_dichloroethylene	2.99	2.49	100.00
chloromethane	3.07	1.89	100.00
,2_Dichloropropane	2.67	2.40	100.00
,3_Dichloropropylene	5.98	4.84	100.00
,1,2,2_Tetrachloroethane	9.09	9.59	100.00
,1,1,2_Tetrachloroethane	4.51	4.38	100.00
tetrachloroethylene	9.10	9.59	100.00
,1,1,1-Trichloroethane	3.43	3.08	100.00
,1,2-Trichloroethane	5.98	4.84	100.00
trichloroethylene	4.32	4.16	100.00
trichlorofluoromethane	2.76	2.12	100.00
trichloroethane	3.33	3.08	100.00
vinyl chloride	1.43	0.61	100.00

ATILE CONTINUING CALIBRATION CHECK

Name: ENGINEERING SCIENCE _____ Contract: _____

Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID.: carbopak Calibration Date(s): 9/8/88 _____

FILE ID: RRF 50 10 _____

Init calib = 9/2/88

FOUND	RRF	RRF50	%D
Benzene _____	5.93	5.00	-15.68
Chlorobenzene _____	4.90	5.17	5.59
1,2-Dichlorobenzene _____	3.97	3.70	-6.91
1,3-Dichlorobenzene _____	4.57	5.22	14.17
1,4-Dichlorobenzene _____	3.83	3.70	-3.51
Tolyl Benzene _____	3.32	4.39	32.27
Toluene _____	3.79	3.70	-2.49
Phenols _____	12.16	18.61	53.03

DATA PACKAGE #52

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**ENGINEERING-SCIENCE, INC.**600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the soil samples received
by this laboratory on 8-16-88.Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88081883	DANGB2-MW37-SS1	BA-I	8-15-88		9-18-88	
88081883	DANGB2-MW37-SS1	CD-I	8-15-88		9-16-88	
88081883	DANGB2-MW37-SS1	CR-I	8-15-88		9-16-88	
88081883	DANGB2-MW37-SS1	PB-I	8-15-88		9-23-88	
88081883	DANGB2-MW37-SS1	418.1	8-15-88	9-09-88	9-11-88	
88081883	DANGB2-MW37-SS1	MOIS	8-15-88		8-21-88	
88081883	DANGB2-MW37-SS1	8010	8-15-88		8-23-88	8-24-88
88081883	DANGB2-MW37-SS1	8020	8-15-88		8-23-88	8-24-88
88081884	DANGB2-MW37-SS2	BA-I	8-15-88		9-18-88	
88081884	DANGB2-MW37-SS2	CD-I	8-15-88		9-16-88	
88081884	DANGB2-MW37-SS2	CR-I	8-15-88		9-16-88	
88081884	DANGB2-MW37-SS2	PB-I	8-15-88		9-23-88	
88081884	DANGB2-MW37-SS2	418.1	8-15-88	9-09-88	9-11-88	
88081884	DANGB2-MW37-SS2	MOIS	8-15-88		8-21-88	
88081884	DANGB2-MW37-SS2	8010	8-15-88		8-23-88	8-23-88
88081884	DANGB2-MW37-SS2	8020	8-15-88		8-23-88	8-23-88
88081885	DANGB2-MW37-SS3	BA-I	8-15-88		9-18-88	
88081885	DANGB2-MW37-SS3	CD-I	8-15-88		9-16-88	
88081885	DANGB2-MW37-SS3	CR-I	8-15-88		9-16-88	
88081885	DANGB2-MW37-SS3	PB-I	8-15-88		9-23-88	
88081885	DANGB2-MW37-SS3	418.1	8-15-88	9-09-88	9-11-88	
88081885	DANGB2-MW37-SS3	MOIS	8-15-88		8-21-88	
88081885	DANGB2-MW37-SS3	8010	8-15-88		8-23-88	8-24-88
88081885	DANGB2-MW37-SS3	8020	8-15-88		8-23-88	8-24-88

* If applicable



ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

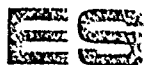
Project: Duluth ANGB

Attached are the analytical reports for the soil samples received
by this laboratory on 8-16-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88081886	DANGB2-MW37-SS4	BA-I	8-15-88		9-18-88	
88081886	DANGB2-MW37-SS4	CD-I	8-15-88		9-16-88	
88081886	DANGB2-MW37-SS4	CR-I	8-15-88		9-16-88	
88081886	DANGB2-MW37-SS4	PB-I	8-15-88		9-23-88	
88081886	DANGB2-MW37-SS4	418.1	8-15-88	9-09-88	9-11-88	
88081886	DANGB2-MW37-SS4	MOIS	8-15-88		8-21-88	
88081886	DANGB2-MW37-SS4	8010	8-15-88		8-23-88	8-24-88
88081886	DANGB2-MW37-SS4	8020	8-15-88		8-23-88	8-24-88
88081887	DANGB2-MW37-SS5	BA-I	8-15-88		9-18-88	
88081887	DANGB2-MW37-SS5	CD-I	8-15-88		9-16-88	
88081887	DANGB2-MW37-SS5	CR-I	8-15-88		9-16-88	
88081887	DANGB2-MW37-SS5	PB-I	8-15-88		9-23-88	
88081887	DANGB2-MW37-SS5	418.1	8-15-88	9-09-88	9-11-88	
88081887	DANGB2-MW37-SS5	MOIS	8-15-88		8-21-88	
88081887	DANGB2-MW37-SS5	8010	8-15-88		8-23-88	8-24-88
88081887	DANGB2-MW37-SS5	8020	8-15-88		8-23-88	8-24-88
88081888	DANGB2-MW39-SS1	BA-I	8-15-88		9-18-88	
88081888	DANGB2-MW39-SS1	CD-I	8-15-88		9-16-88	
88081888	DANGB2-MW39-SS1	CR-I	8-15-88		9-16-88	
88081888	DANGB2-MW39-SS1	PB-I	8-15-88		9-23-88	
88081888	DANGB2-MW39-SS1	418.1	8-15-88	9-09-88	9-11-88	
88081888	DANGB2-MW39-SS1	MOIS	8-15-88		8-21-88	
88081888	DANGB2-MW39-SS1	8010	8-15-88		8-24-88	8-23-88
88081888	DANGB2-MW39-SS1	8020	8-15-88		8-24-88	8-24-88

* If applicable



ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Attached are the analytical reports for the soil samples received by this laboratory on 8-16-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88081889	DANGB2-MW39-SS2	BA-I	8-15-88		9-18-88	
88081889	DANGB2-MW39-SS2	CD-I	8-15-88		9-16-88	
88081889	DANGB2-MW39-SS2	CR-I	8-15-88		9-16-88	
88081889	DANGB2-MW39-SS2	PB-I	8-15-88		9-23-88	
88081889	DANGB2-MW39-SS2	418.1	8-15-88	9-09-88	9-11-88	
88081889	DANGB2-MW39-SS2	MOIS	8-15-88		8-21-88	
88081889	DANGB2-MW39-SS2	8010	8-15-88		8-24-88	8-24-88
88081889	DANGB2-MW39-SS2	8020	8-15-88		8-23-88	8-24-88
88081890	DANGB2-MW39-SS3	BA-I	8-15-88		9-18-88	
88081890	DANGB2-MW39-SS3	CD-I	8-15-88		9-16-88	
88081890	DANGB2-MW39-SS3	CR-I	8-15-88		9-16-88	
88081890	DANGB2-MW39-SS3	PB-I	8-15-88		9-23-88	
88081890	DANGB2-MW39-SS3	418.1	8-15-88	9-09-88	9-11-88	
88081890	DANGB2-MW39-SS3	MOIS	8-15-88		8-21-88	
88081890	DANGB2-MW39-SS3	8010	8-15-88		8-25-88	8-23-88
88081890	DANGB2-MW39-SS3	8020	8-15-88		8-25-88	8-25-88

* If applicable

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88081883-88081890
WORK ORDER NO.: 856

These soil samples were received at the ES Berkeley Laboratory on 8-16-88. They were received cold and intact.

1/15/88

ANALYSIS REPORT

WORK ORDER NUMBER: 85-
 JOB NUMBER : ZB000000446
 WORK ORDER DATE : 06/16/98

APPROVED BY

[Signature]
 Lab Supervisor

REPORT DATA:
 ES OAK RIDGE/DULUTH ANGE
 710 S. ILLINOIS AVE. STE. S103
 OAK RIDGE, TN 37830
 BILL HAYDEN

CLIENT DATA:
 ES OAK RIDGE/DULUTH ANGE (154)
 710 S ILLINOIS AVE. STE. S103
 OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : GP091
 CONTACT : BILL HAYDEN
 (615)-481-3920

TASK: 2. UNITS: mg/Kg

	DANGB2-MW37-SS1	DANGB2-MW37-SS2	DANGB2-MW37-SS3	DANGB2-MW37-SS4	DANGB2-MW37-SS5	DANGB2-MW39-SS1
	6-15-88	6-15-88	8-15-88	8-15-88	8-15-88	8-15-88
TEST COMPOUND	88081883	88081884	88081885	88081886	88081887	88081888
ACID DIG SOIL	NA	NA	NA	NA	NA	NA
BARIUM	75.0	52.5	52.0	58.4	55.4	61.2
CAESIUM	13.5*H	12.2*H	11.5*H	11.2*H	11.8*H	12.0*H
CHROMIUM	37.9	24.6	29.6	27.8	25.6	23.1
LEAD	4.2	3.5	2.0	4.05	3.4	4.1

NA - Not Analyzed

2791

ND - Not Detected

1-1-88

ANALYSIS REPORT FOR WORK ORDER NUMBER 356

BSV: 2. UNITS: mg/l

EST COMPOUND	DANSG2-MW39-552	DANSG2-MW39-553
	8-15-88	8-15-88
	88081880	88081590
	-----	-----
TOBACCO SOIL	NA	NA
ARIUM	60.0	40.5
ARIUM	10.0	10.0
ARIUM	0.0	22.0
ARIUM	0.0	0.0

NA - Not Analyzed

- Not Detected

2792

10/10/84

ANALYSIS REPORT

WORK ORDER NUMBER: 856
JOB NUMBER : Z80000000440
WORK ORDER DATE : 08/11/84

APPROVED BY *[Signature]*
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ARGE
710 S. ILLINOIS AVE. STE. 5103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ARGE 1 1341
710 S. ILLINOIS AVE. STE 5103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : 38001
CONTACT : BILL HAYDEN
1615-481-3920

TASK: 3, UNITS: mg/Kg

	DANGB2-MW57-SS1	DANGB2-MW57-SS2	DANGB2-MW37-SS3	DANGB2-MW37-SS4	DANGB2-MW37-SS5	DANGB2-MW39-SS1
	9-15-88	8-15-88	8-15-88	8-15-88	8-15-88	8-15-88
TEST COMPOUND	88081883	88081884	88081885	88081886	88081887	88081888
418.1 PETROLEUM HYDROCARBONS	<100	100	<100	<100	<100	<100
% MOISTURE	14.0	19.8	14.8	8.4	9.9	11.7

ANALYSIS REPORT FOR WORK ORDER NUMBER 856

REF: 5, UNITS: mg/kg

	DANC82-MW39-SS2	DANC82-MW39-SS3
	8-15-88	8-15-88
TEST COMPOUND	85081889	85081890
PETROLEUM HYDROCARBONS	<100	<100
MOISTURE	12.5	8.4

1976

ANALYSIS REPORT

WORK ORDER NUMBER: 256
 JOB NUMBER : Z6000000440
 WORK ORDER DATE : 08/16/88

APPROVED BY

Lab Supervisor

REPORT DATA:
 ES OAK RIDGE/DULUTH ANGB
 710 S. ILLINOIS AVE. STE. S103
 OAK RIDGE, TN 37830
 BILL HAYDEN

CLIENT DATA:
 ES OAK RIDGE/DULUTH ANGB (134)
 710 S. ILLINOIS AVE STE. S103
 OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTACT / PO # : 06001
 CONTACT : BILL HAYDEN
 (615)-461-3920

TASK: 4, UNITS: ug/Kg, GROUP 2610

	DANG82-MW37-SS1	DANG82-MW37-SS2	DANG82-MW37-SS3	DANG82-MW37-SS4	DANG82-MW37-SS5	DANG82-MW39-SS1
	8-15-88	8-15-88	8-15-88	8-15-88	8-15-88	8-15-88
TEST COMPOUND	88081883	88081884	88081885	88081886	88081887	88081888
BENZYL CHLORIDE	ND	ND	ND	ND	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND	ND	ND	ND	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND	ND	ND	ND	ND	ND
BROMOBENZENE	ND	ND	ND	ND	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND	ND	ND	ND
BROMOFORM	ND	ND	ND	ND	ND	ND
BROMOETHANE	ND	ND	ND	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND	ND	ND	ND
CHLOROACETALDEHYDE	ND	ND	ND	ND	ND	ND
CHLORAL	ND	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND
CHLOROETHANE	ND	ND	ND	ND	ND	ND
CHLOROFORM	0.178	ND	ND	ND	ND	ND
1-CHLOROHXANE	ND	ND	ND	ND	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND	ND	ND	ND	ND
CHLOROMETHANE	ND	ND	ND	ND	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND	ND	ND	ND	ND
CHLOROTOLUENE	ND	ND	ND	ND	ND	ND
DIBROMOCHLOROMETHANE	ND	ND	ND	ND	ND	ND
DIBROMOMETHANE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
DICHLOROMETHANE	6.38	2.93	2.18	2.28	3.88	188
1,2-DICHLOROPROPANE	ND	ND	ND	ND	ND	ND

ND - Not Detected

ANALYST'S REPORT FOR LOEY GROUP NUMBER 1 36

- Not Generated

ANALYSIS REPORT FOR WORK ORDER NUMBER 556

TASK: 4, UNITS: ug/kg. GROUP 8010

DANGB2-MW39-552 DANG52-MW39-553

8-15-68 8-15-68

TEST COMPOUND 88081885 88091890

TEST COMPOUND	88081885	88091890
BENZYL CHLORIDE	NO	NO
BIS (2-CHLOROETHOXY)METHANE	NO	NO
BIS (2-CHLOROISOPROPYL)ETHER	NO	NO
BROMOBENZENE	NO	NO
BROMODICHLOROMETHANE	NO	NO
BROMOFORM	NO	NO
BROMOTETRAFLUOROETHANE	NO	NO
CARBON TETRACHLORIDE	NO	NO
CHLOROACETALDEHYDE	NO	NO
CHLORAL	NO	NO
CHLOROBENZENE	NO	NO
CHLOROETHANE	NO	NO
CHLOROFORM	NO	NO
1-CHLOROHXANE	NO	NO
2-CHLOROETHYL VINYL ETHER	NO	NO
CHLOROMETHANE	NO	NO
CHLOROMETHYL METHYL ETHER	NO	NO
CHLOROTOLUENE	NO	NO
DIBROMOCHLOROMETHANE	NO	NO
DIBROMOMETHANE	NO	NO
1,2-DICHLOROBENZENE	NO	NO
1,3-DICHLOROBENZENE	NO	NO
1,4-DICHLOROBENZENE	NO	NO
5-DICHLORODIFLUOROMETHANE	NO	NO
1,1-DICHLOROETHANE	NO	NO
1,2-DICHLOROETHANE	NO	NO
1,1-DICHLOROETHYLENE	NO	NO
TRANS-1,2-DICHLOROETHYLENE	NO	NO
DICHLOROMETHANE	4.68	4.96
1,2-DICHLOROPROPANE	NO	NO
1,3-DICHLOROPROPYLENE	NO	NO
1,1,2,2-TETRACHLOROETHANE	NO	NO
1,1,1,2-TETRACHLOROETHANE	NO	NO
TETRACHLOROETHYLENE	NO	NO
1,1,1-TRICHLOROETHANE	NO	NO
1,1,2-TRICHLOROETHANE	NO	NO
TRICHLOROETHYLENE	NO	NO
TRICHLOROFLUOROMETHANE	NO	NO
TRICHLOROPROPANE	NO	NO
VINYL CHLORIDE	NO	NO

NO - Not Detected

2797

11/13/88

ANALYSIS REPORT

ORDER NUMBER: 854
 IN NUMBER: 2300000000440
 ORDER DATE: 08/16/88

APPROVED BY

RWB
 Lab Supervisor

REPORT DATA:

ES OAK RIDGE/DULUTH ANGE
 210 S. ILLINOIS AVE. STE. 3103
 OAK RIDGE, TN 37830
 BILL HAYDEN

CLIENT DATA:

ES OAK RIDGE/DULUTH ANGE (174)
 210 S. ILLINOIS AVE. STE. 3103
 OAK RIDGE, TN 37830

OF REPORT COPIES: 1.

TRACT PO # : 00001
 CONTACT : BILL HAYDEN
 (615)-481-3920

REF: 4. UNITS: ug/lq. GROUP 8020

	DANGB2-MW37-SS1	DANGB2-MW37-SS2	DANGB2-MW37-SS3	DANGB2-MW37-SS4	DANGB2-MW37-SS5	DANGB2-MW37-SS6
	8-15-88	8-15-88	8-15-88	8-15-88	8-15-88	8-15-88
EST COMPOUND	28081883	38081834	88081895	88081886	88081897	88081888
-----	-----	-----	-----	-----	-----	-----
BENZENE	ND	ND	ND	ND	ND	ND
MONOCHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
ETHYL BENZENE	ND	ND	ND	ND	ND	ND
TOLUENE	38	20	44	56	51	1.4
XYLENES	ND	ND	ND	ND	ND	ND

ANALYSIS REPORT FOR WORK ORDER NUMBER 856

TASK: 4, UNITS: ug/Kg, GROUP 8020

TEST COMPOUND	DANGB2-MW39-SS2 8-15-88 88081880	DANGB2-MW39-SS3 8-15-88 88081390
BENZENE	ND	ND
CHLOROBENZENE	HL	ND
1,2-DICHLOROBENZENE	ND	ND
1,3-DICHLOROBENZENE	ND	ND
1,4-DICHLOROBENZENE	ND	ND
ETHYL BENZENE	ND	ND
TOLUENE	526	12
XYLENES	ND	ND

CHAIN OF CUSTODY RECORD

ES JOB NO.	PROJECT NAME/LOCATION	SHIP TO:
OR001	Duluth ANGB/Duluth, Mn.	ENGINEERING-SCIENCE LABORATORY, INC. 600 Bancroft Way Berkeley, CA. 94710
SAMPLER(S): (Signature)		
DATE	TIME	SAMPLE DESCRIPTION
8-15-88	1255	DANGB2 - MW37 - SS1
8-15-88	1255	DANGB2 - MW37 - SS1
8-15-88	1324	DANGB2 - MW37 - SS2
8-15-88	1328	DANGB2 - MW37 - SS2
8-15-88	1326	DANGB2 - MW37 - SS3
8-15-88	1326	DANGB2 - MW37 - SS3
8-15-88	1322	DANGB2 - MW37 - SS4
8-15-88	1322	DANGB2 - MW37 - SS4
8-15-88	1324	DANGB2 - MW37 - SS5
8-15-88	1324	DANGB2 - MW37 - SS5
2800		
<div> <div>Relinquished by: (Signature)</div> <div>Received by: (Signature)</div> </div>		
<div> <div>Relinquished by: (Signature)</div> <div>Received for Laboratory by: (Signature)</div> </div>		

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: VGC-S-0035-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 8-15-88
Date Prepared: NA
Date Analyzed: 8-25-88
Date Reported: 9-16-88
Dilution Factor: NA
% Moisture: 10.8

Project: Duluth ANGB
Laboratory Supervisor Approval: MMB

QC Report for Laboratory Sample No(s):
88081749-88081754, 88081877-88081879,
88081883-88081890

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits % Recovery
88081878	Halocarbons: 8010									
	1,1-dichloroethane	11.2	ND	14.4	129*	12.3	110	16	20	58-124
	Trichloroethane	11.2	ND	14.0	125*	12.1	108	15	16	75-110
	Chlorobenzene	11.2	ND	12.7	113	10.8	97	16	21	71-125
88081878 28002	Aromatics: 8020									
	Benzene	11.2	ND	11.3	101	11.2	100	1	26	75-123
	Toluene	11.2	1.4	12.1	96	10.8	84	11	16	79-115
	Chlorobenzene	11.2	ND	10.6	95	9.8	88	8	24	82-112

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* Percent recoveries do not meet the ES QC limits. Blank spike analysis shows the laboratory to be in control.

$$\text{Relative Percent Difference (PR)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(\text{MS or MSD}) - \text{SR}}{\text{SA}} \times 100$$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001
Client: ES Oak Ridge
Address: Bill Hayden
710 S. Illinois Avenue
Suite F-103
Oak Ridge, TN. 37830

QC Report No: VGC-S-0035-88B
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: NA
Date Prepared: NA
Date Analyzed: 8-25-88
Date Reported: 9-16-88
Dilution Factor: NA
% Moisture: NA

Project: Duluth AUGB
Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s).:
88081749-88081754, 88081877-88081879
88081883-88081890

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
Blank	Halocarbons: 8010									
	1,1-dichloroethane	10.0	ND	9.73	97	9.82	98	1	20	58-124
	Trichloroethene	10.0	ND	9.82	98	10.1	101	3	16	75-110
	Chlorobenzene	10.0	ND	10.1	101	9.55	96	6	21	71-125
2803 Blank	Aromatics: 8020									
	Benzene	10.0	ND	9.46	95	10.0	100	6	26	75-123
	Toluene	10.0	ND	8.75	88	9.28	93	6	16	79-115
	Chlorobenzene	10.0	ND	10.2	102	9.89	98	4	24	82-112

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

$$\text{Relative Percent Difference (PR)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{\text{SA}}{\text{MS or MSD}} - \text{SR} \times 100$$

SA = Spike Added (Concentration)
MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No:

00001

Client:

ES Oak Ridge
Bill Hayden

Attn:

710 S. Illinois Avenue
Suite F-103

Address:

Oak Ridge, Tn. 37830

Sample Matrix: Soil
Conc. Unit: ug/KG
Date Reported: 9-16-88

Laboratory Supervisor Approval:

[Signature]

Project:

Duluth ANGB

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
59	8-23-88	VGC	Carbopack	75-09-2 67-66-3	Dichloromethane Chloroform	5.8 0.1	0.5 0.05	88081877-88081889
93	8-25-88	VGC	Carbopack	75-09-2	Dichloromethane	9.3	0.5	88081890

2804

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
Samples No.: 88081877-88081879
Samples No.: 88081883-88081890
Samples No.: 88081938-88081942
Samples No.: 88082000-88082002

The results obtained for the laboratory control sample (LCS) analyzed with these samples for the analytes Cadmium, Chromium, and Barium exceeded the recommended EPA recoveries. All data associated with this batch was closely inspected and no analytical problems were found. The initial and continuing calibration verification standards and blanks and precision and accuracy recoveries were within acceptable limits with the following exceptions:

Cadmium spike recoveries and precision exceeded acceptable limits. The spike sample was followed by an analytical spike as required by laboratory standard operating procedure. The results of the analytical spike recovery for Cadmium were within acceptable ranges.

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.:

OR001

Client:

ES Oak Ridge

Attn:

Bill Hayden

Address:

710 S. Illinois Avenue

Suite F-103

Oak Ridge, Tn.

37830

TPH-S-0045-88

QC Report No:

Sample Matrix:

Conc. Unit:

Date Received:

Date Prepared:

Date Analyzed:

Date Reported:

Dilution Factor:

%Moisture:

Soil

mg/KG

8-11-88

9-09-88

9-11-88

9-21-88

6.5

17.8

Project:

Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):

88081749-88081754, 88081877-88081879

88081883-88081890

[Signature]

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88081749	418.1	<100	<100	1220	1050	86	876	83	18	
88081883										
88081877										
88081879										

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

MS = Spike Sample
MSD = Spike Duplicate

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

SR = Sample Result
SA = Spike Added (Concentration)

2803

QUALITY CONTROL RESULTS SUMMARY METALS

Job No.: OR001 QC Report No: ICP-S-0027-88

Client: ES Oak Ridge Sample Matrix: Soil

Attn: Bill Hayden Conc. Unit: mg/KG

Address: 710 S. Illinois Avenue Date Received: 8-15-88

Suite F-103 Date Reported: 10-13-88

Oak Ridge, Tn. 37830 Dilution Factor: NA

 %Moisture: 9.6

Project: Duluth ANGB Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88081877-88081879, 88081883-88081890
88081938-88081942, 88082000-88082002

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	C1	Duplicate C2	RPD	SA	SR	SSR	PR	Notes
Barium	88081879	88081879	9-18-88	9-09-88	6010	<20	40.2	37.2	8	221	40.2	275	106	
Cadmium	88081879	88081879	9-16-88	9-09-88	6010	<0.5	6.31	10.6	51*	5.53	6.31	14.6	150N	
Chromium	88081879	88081879	9-16-88	9-09-88	6010	<1.0	20.9	22.7	8	22.1	20.9	47.0	118	

2807

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* See Legend attached.
N See Legend attached.


Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$ C1 = Concentration One NA = Not Applicable
C2 = Concentration Two NC = Not Calculated

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$ SSR = Spiked Sample Result ND = Not Detected
SR = Sample Result SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY METALS

Job No.: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: AAF-S-0027-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 8-15-88
Date Reported: 10-10-88
DDilution Factor: NA
%Moisture: 9.6

Project: Duluth ANGB
Laboratory Supervisor Approval:


QC Report for Laboratory Sample No(s):
88081877-88081879, 88081883-88081890
88081898-88081900

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	C1	Duplicate C2	RPD	SA	SR	Spike Recovery SSR	PR Notes
Lead	88081879	88081879	9-21-88	9-17-88	7421	<0.5	2.81	2.52	11	5.53	2.81	7.43	84
228008													

NOTE: If moisture is reported, results are presented on a dry-weight basis.

$$\text{Relative Percent Difference (RPD)} = \frac{C1 - C2}{(C1 + C2)/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{SSR - SR}{SA} \times 100$$

C1 = Concentration One
C2 = Concentration Two
SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)
NA = Not Applicable
NC = Not Calculated
ND = Not Detected

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

page 1 of 5

Date Received: August 16, 1988
Date Reported: October 25, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081883	88081884
Sample No.:	DANGB2-MW37-SS1	DANGB2-MW37-SS2
Date Sampled:	8-15-88	8-15-88
Time Sampled:	12:55	13:28
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-01-88
Percent Moisture:	14	11

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
1,3-Dichlorobenzene	330	ND	ND
1,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Bis(2-chloroethyl)ether	330	ND	ND
1,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Bis(2-chloroisopropyl)ether	330	ND	ND
N-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
Nitrobenzene	330	ND	ND
Isophorone	330	ND	ND
Naphthalene	330	ND	ND
Bis(2-chloroethoxy)methane	330	ND	ND
2-Chloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
Acenaphthylene	330	ND	ND
Acenaphthene	330	ND	ND
Dimethyl phthalate	330	ND	ND
2,6-Dinitrotoluene	330	ND	ND
Fluorene	330	ND	ND
2,4-Dinitrotoluene	330	ND	ND
Diethyl phthalate	330	ND	ND
N-Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

page 2 of 5

Date Received: August 16, 1988
Date Reported: October 25, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081883	88081884
Sample No.:	DAN6B2-MW37-SS1	DAN6B2-MW37-SS2
Date Sampled:	8-15-88	8-15-88
Time Sampled:	12:55	13:28
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-01-88
Percent Moisture:	.14	11

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Dibutyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Butyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
4-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benzidine	2000	ND	ND
3,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Page 3 of 5

Date Received: August 16, 1988
Date Reported: October 25, 1988

Work Order: 856
Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081883	88081884
Sample No.:	DANGB2-MW37-SS1	DANGB2-MW37-SS2
Date Sampled:	8-15-88	8-15-88
Time Sampled:	12:55	13:28
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-01-88
Percent Moisture:	14	11

Compound	Detection Limits ug/kg	Analytical Results (dry weight)	
		ug/kg	ug/kg
Acetophenone	---	ND	ND
Aniline	---	ND	ND
4-Aminobiphenyl	---	ND	ND
4-Chloroaniline	660	ND	ND
1-Chloronaphthalene	---	ND	ND
Dibenzofuran	330	ND	ND
p-Dimethylaminoazobenzene	---	ND	ND
7,12-Dimethylbenz(a)anthracene	---	ND	ND
a-,a-Dimethylphenethylamine	---	ND	ND
Diphenylamine	---	ND	ND
1,2-Diphenylhydrazine	---	ND	ND
Ethyl methanesulfonate	---	ND	ND
3-Methylcholanthrene	---	ND	ND
Methyl methanesulfonate	---	ND	ND
2-Methylnaphthalene	330	ND	ND
1-Naphthylamine	---	ND	ND
2-Naphthylamine	---	ND	ND
2-Nitroaniline	1600	ND	ND
3-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
N-Nitroso-di-n-butylamine	---	ND	ND
N-Nitrosopiperidine	---	ND	ND
Pentachlorobenzene	---	ND	ND
Pentachloronitrobenzene	---	ND	ND
Phenacetin	---	ND	ND
2-Picoline	---	ND	ND
Pronamide	---	ND	ND
1,2,4,5-Tetrachlorobenzene	---	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

page 4 of 5

Date Received: August 16, 1988
Date Reported: October 25, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN:Mr. Bill Hayden

Lab Number:	88081883	88081884
Sample No.:	DANGB2-MW37-SS1	DANGB2-MW37-SS2
Date Sampled:	8-15-88	8-15-88
Time Sampled:	12:55	13:28
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-01-88
Percent Moisture:	14	11

Compound	Detection	ANALYTICAL RESULTS	
	Limits	(dry weight)	
	ug/kg	ug/kg	ug/kg
Alpha-BHC	--*	ND	ND
Gamma-BHC	--*	ND	ND
Beta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Aldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
Dieldrin	500	ND	ND
4,4'-DDE	1000	ND	ND
Endrin	--*	ND	ND
Endosulfan II	--*	ND	ND
4,4'-DDD	500	ND	ND
4,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	--*	ND	ND
Endrin Ketone	--*	ND	ND
Chlordane	2000	ND	ND
Methoxychlor	--*	ND	ND
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1248	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

page 5 of 5

Date Received: August 16, 1988
Date Reported: October 25, 1988

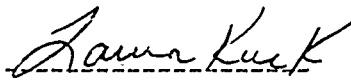
Work Order: 856
Job Number: OR001

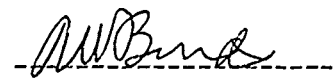
FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081883	88081884
Sample No.:	DANGB2-MW37-SS1	DANGB2-MW37-SS2
Date Sampled:	8-15-88	8-15-88
Time Sampled:	12:55	13:28
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-01-88
Percent Moisture:	14	11

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
2-Chlorophenol	330	ND	ND
2-Nitrophenol	330	ND	ND
Phenol	330	ND	ND
2,4-Dimethylphenol	330	ND	ND
2,4-Dichlorophenol	330	ND	ND
2,4,6-Trichlorophenol	330	ND	ND
4-Chloro-3-methylphenol	660	ND	ND
2,4-Dinitrophenol	1600	ND	ND
2,6-Dichlorophenol	---	ND	ND
2-Methyl-4,6-Dinitrophenol	1600	ND	ND
Pentachlorophenol	1600	ND	ND
4-Nitrophenol	1600	ND	ND
Benzoic Acid	1600	ND	ND
2-Methylphenol	330	ND	ND
3- & 4-Methylphenol	330	ND	ND
2,3,4,6-Tetrachlorophenol	---	ND	ND
2,4,5-Trichlorophenol	330	ND	ND


Analyst


Laboratory Supervisor

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

page 1 of 5

Date Received: August 16, 1988
Date Reported: October 25, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081885	88081886
Sample No.:	DANGB2-MW37-SS3	DANGB2-MW37-SS4
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:26	13:22
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-03-88
Percent Moisture:	15	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
1,3-Dichlorobenzene	330	ND	ND
1,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Bis(2-chloroethyl)ether	330	ND	ND
1,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Bis(2-chloroisopropyl)ether	330	ND	ND
N-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
Nitrobenzene	330	ND	ND
Isophorone	330	ND	ND
Naphthalene	330	ND	ND
Bis(2-chloroethoxy)methane	330	ND	ND
2-Chloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
Acenaphthylene	330	ND	ND
Acenaphthene	330	ND	ND
Dimethyl phthalate	330	ND	ND
2,6-Dinitrotoluene	330	ND	ND
Fluorene	330	ND	ND
2,4-Dinitrotoluene	330	ND	ND
Diethyl phthalate	330	ND	ND
N-Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

page 2 of 5

Date Received: August 16, 1988
Date Reported: October 25, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081885	88081886
Sample No.:	DANGB2-MW37-SS3	DANGB2-MW37-SS4
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:26	13:22
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-03-88
Percent Moisture:	15	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Dibutyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Butyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
4-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benazidine	2000	ND	ND
3,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Page 3 of 5

Date Received: August 16, 1988
Date Reported: October 25, 1988

Work Order: 856
Job Number: 0R001

For: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081885	88081886
Sample No.:	DANGB2-MW37-SS3	DANGB2-MW37-SS4
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:26	13:22
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-03-88
Percent Moisture:	15	8

Compound	Detection Limits ug/kg	Analytical Results (dry weight)	
		ug/kg	ug/kg
Acetophenone	--*	ND	ND
Aniline	--*	ND	ND
4-Aminobiphenyl	--*	ND	ND
4-Chloroaniline	560	ND	ND
1-Chloronaphthalene	--*	ND	ND
Dibenzofuran	330	ND	ND
p-Dimethylaminoazobenzene	--*	ND	ND
7,12-Dimethylbenz(a)anthracene	--*	ND	ND
a-,a-Dimethylphenethylamine	--*	ND	ND
Diphenylamine	--*	ND	ND
1,2-Diphenylhydrazine	--*	ND	ND
Ethyl methanesulfonate	--*	ND	ND
3-Methylcholanthrene	--*	ND	ND
Methyl methanesulfonate	--*	ND	ND
2-Methylnaphthalene	330	ND	ND
1-Naphthylamine	--*	ND	ND
2-Naphthylamine	--*	ND	ND
2-Nitroaniline	1600	ND	ND
3-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
N-Nitroso-di-n-butylamine	--*	ND	ND
N-Nitrosopiperidine	--*	ND	ND
Pentachlorobenzene	--*	ND	ND
Pentachloronitrobenzene	--*	ND	ND
Phenacetin	--*	ND	ND
2-Picoline	--*	ND	ND
Pronamide	--*	ND	ND
1,2,4,5-Tetrachlorobenzene	--*	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

page 4 of 5

Date Received: August 16, 1988
Date Reported: October 25, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN:Mr. Bill Hayden

Lab Number:	88081885	88081886
Sample No.:	DANGB2-MW37-SS3	DANGB2-MW37-SS4
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:26	13:22
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-03-88
Percent Moisture:	15	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Alpha-BHC	--*	ND	ND
Gamma-BHC	--*	ND	ND
Beta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Aldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
Dieldrin	500	ND	ND
4,4'-DDE	1000	ND	ND
Endrin	--*	ND	ND
Endosulfan II	--*	ND	ND
4,4'-DDD	500	ND	ND
4,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	--*	ND	ND
Endrin Ketone	--*	ND	ND
Chlordane	2000	ND	ND
Methoxychlor	--*	ND	ND
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1248	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

page 5 of 5

Date Received: August 16, 1988
Date Reported: October 25, 1988

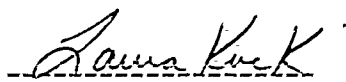
Work Order: 856
Job Number: OR001

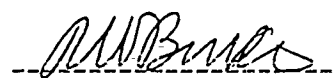
FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081885	88081886
Sample No.:	DANGB2-MW37-SS3	DANGB2-MW37-SS4
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:26	13:22
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-03-88
Percent Moisture:	15	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
2-Chlorophenol	330	ND	ND
2-Nitrophenol	330	ND	ND
Phenol	330	ND	ND
2,4-Dimethylphenol	330	ND	ND
2,4-Dichlorophenol	330	ND	ND
2,4,6-Trichlorophenol	330	ND	ND
4-Chloro-3-methylphenol	660	ND	ND
2,4-Dinitrophenol	1600	ND	ND
2,6-Dichlorophenol	--*	ND	ND
2-Methyl-4,6-Dinitrophenol	1600	ND	ND
Pentachlorophenol	1600	ND	ND
4-Nitrophenol	1600	ND	ND
Benzoic Acid	1600	ND	ND
2-Methylphenol	330	ND	ND
3- & 4-Methylphenol	330	ND	ND
2,3,4,6-Tetrachlorophenol	--*	ND	ND
2,4,5-Trichlorophenol	330	ND	ND


Analyst


Laboratory Supervisor

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

page 1 of 5

Date Received: August 16, 1988
Date Reported: December 9, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081887	88081889
Sample No.:	DANGB2-MW37-SS5	DANGB2-MW39-SS2
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:28	16:42
Date Extracted:	10-28-88	10-28-88
Date Analyzed:	11-02-88	11-02-88
Percent Moisture:	10	13

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
1,3-Dichlorobenzene	330	ND	ND
1,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Bis(2-chloroethyl)ether	330	ND	ND
1,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Bis(2-chloroisopropyl)ether	330	ND	ND
N-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
Nitrobenzene	330	ND	ND
Isophorone	330	ND	ND
Naphthalene	330	ND	ND
Bis(2-chloroethoxy)methane	330	ND	ND
2-Chloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
Acenaphthylene	330	ND	ND
Acenaphthene	330	ND	ND
Dimethyl pthalate	330	ND	ND
2,6-Dinitrotoluene	330	ND	ND
Fluorene	330	ND	ND
2,4-Dinitrotoluene	330	ND	ND
Diethyl phthalate	330	ND	ND
N-Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

page 2 of 5

Date Received: August 16, 1988
Date Reported: December 9, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081887	88081889
Sample No.:	DANGB2-MW37- SS5	DANGB2-MW39- SS2
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:28	16:42
Date Extracted:	10-28-88	10-28-88
Date Analyzed:	11-02-88	11-02-88
Percent Moisture:	10	13

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Dibutyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Butyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
4-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benzydine	2000	ND	ND
3,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Page 3 of 5

Date Received: August 16, 1988
Date Reported: December 9, 1988

Work Order: 856
Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081887	88081889
Sample No.:	DANGB2-MW37- SS5	DANGB2-MW39- SS2
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:28	16:42
Date Extracted:	10-28-88	10-28-88
Date Analyzed:	11-02-88	11-02-88
Percent Moisture:	10	13

Compound	Detection Limits ug/kg	Analytical Results (dry weight)	
		ug/kg	ug/kg
Acetophenone	--*	ND	ND
Aniline	--*	ND	ND
4-Aminobiphenyl	--*	ND	ND
4-Chloroaniline	660	ND	ND
1-Chloronaphthalene	--*	ND	ND
Dibenzofuran	330	ND	ND
p-Dimethylaminoazobenzene	--*	ND	ND
7,12-Dimethylbenz(a)anthracene	--*	ND	ND
a-,a-Dimethylphenethylamine	--*	ND	ND
Diphenylamine	--*	ND	ND
1,2-Diphenylhydrazine	--*	ND	ND
Ethyl methanesulfonate	--*	ND	ND
3-Methylcholanthrene	--*	ND	ND
Methyl methanesulfonate	--*	ND	ND
2-Methylnaphthalene	330	ND	ND
1-Naphthylamine	--*	ND	ND
2-Naphthylamine	--*	ND	ND
2-Nitroaniline	1600	ND	ND
3-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
N-Nitroso-di-n-butylamine	--*	ND	ND
N-Nitrosopiperidine	-	ND	ND
Pentachlorobenzene	---	ND	ND
Pentachloronitrobenzene	--*	ND	ND
Phenacetin	---	ND	ND
2-Picoline	---	ND	ND
Pronamide	---	ND	ND
1,2,4,5-Tetrachlorobenzene	--*	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

page 4 of 5

Date Received: August 16, 1988
Date Reported: December 9, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN:Mr. Bill Hayden

Lab Number:	88081887	88081889
Sample No.:	DANGB2-MW37- SS5	DANGB2-MW39- SS2
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:28	16:42
Date Extracted:	10-28-88	10-28-88
Date Analyzed:	11-02-88	11-02-88
Percent Moisture:	10	13

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Alpha-BHC	--*	ND	ND
Gamma-BHC	--*	ND	ND
Beta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Aldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
Dieldrin	500	ND	ND
1,4'-DDE	1000	ND	ND
Endrin	--*	ND	ND
Endosulfan II	--*	ND	ND
1,4'-DDD	500	ND	ND
1,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	--*	ND	ND
Endrin Ketone	--*	ND	ND
Chlordane	2000	ND	ND
Methoxychlor	--*	ND	ND
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1248	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

page 5 of 5

Date Received: August 16, 1988
Date Reported: December 9, 1988

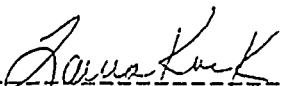
Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081887	88081889
Sample No.:	DANG82-MW37- SS5	DANG82-MW39- SS2
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:28	16:42
Date Extracted:	10-28-88	10-28-88
Date Analyzed:	11-02-88	11-02-88
Percent Moisture:	10	13

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
2-Chlorophenol	330	ND	ND
2-Nitrophenol	330	ND	ND
Phenol	330	ND	ND
2,4-Dimethylphenol	330	ND	ND
2,4-Dichlorophenol	330	ND	ND
2,4,6-Trichlorophenol	330	ND	ND
4-Chloro-3-methylphenol	660	ND	ND
2,4-Dinitrophenol	1600	ND	ND
2,6-Dichlorophenol	--*	ND	ND
2-Methyl-4,6-Dinitrophenol	1600	ND	ND
Pentachlorophenol	1600	ND	ND
4-Nitrophenol	1600	ND	ND
Benzoic Acid	1600	ND	ND
2-Methylphenol	330	ND	ND
3- & 4-Methylphenol	330	ND	ND
2,3,4,6-Tetrachlorophenol	--*	ND	ND
2,4,5-Trichlorophenol	330	ND	ND



Analyst



Laboratory Supervisor

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

2823

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

page 1 of 5

Date Received: August 16, 1988
Date Reported: December 9, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081888	88081890
Sample No.:	DANGB2-MW39-SS1	DANGB2-MW39-SS3
Date Sampled:	8-15-88	8-15-88
Time Sampled:	16:24	17:05
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-03-88	10-03-88
Percent Moisture:	12	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
1,3-Dichlorobenzene	330	ND	ND
1,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Bis(2-chloroethyl)ether	330	ND	ND
1,3-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Bis(2-chloroisopropyl)ether	330	ND	ND
N-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
Nitrobenzene	330	ND	ND
Isophorone	330	ND	ND
Naphthalene	330	ND	ND
Bis(2-chloroethoxy)methane	330	ND	ND
2-Chloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
Acenaphthylene	330	ND	ND
Acenaphthene	330	ND	ND
Dimethyl phthalate	330	ND	ND
2,6-Dinitrotoluene	330	ND	ND
Fluorene	330	ND	ND
2,4-Dinitrotoluene	330	ND	ND
Diethyl phthalate	330	ND	ND
N-Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

page 2 of 5

Date Received: August 16, 1988
Date Reported: December 9, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081888	88081890
Sample No.:	DANGB2-MW39- SS1	DANGB2-MW39- SS3
Date Sampled:	8-15-88	8-15-88
Time Sampled:	16:24	17:05
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-03-88	10-03-88
Percent Moisture:	12	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Dibutyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Butyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
4-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benzydine	2000	ND	ND
3,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Page 3 of 5

Date Received: August 16, 1988
Date Reported: December 9, 1988

Work Order: 856
Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081888	88081890
Sample No.:	DANGB2-MW39-SS1	DANGB2-MW39-SS3
Date Sampled:	8-15-88	8-15-88
Time Sampled:	16:24	17:05
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-03-88	10-03-88
Percent Moisture:	12	8

Compound	Detection Limits ug/kg	Analytical Results (dry weight)	
		ug/kg	ug/kg
Acetophenone	--*	ND	ND
Aniline	--*	ND	ND
4-Aminobiphenyl	--*	ND	ND
4-Chloroaniline	660	ND	ND
1-Chloronaphthalene	--*	ND	ND
Dibenzofuran	330	ND	ND
p-Dimethylaminoazobenzene	--*	ND	ND
7,12-Dimethylbenz(a)anthracene	--*	ND	ND
a-,a-Dimethylphenethylamine	--*	ND	ND
Diphenylamine	--*	ND	ND
1,2-Diphenylhydrazine	--*	ND	ND
Ethyl methanesulfonate	--*	ND	ND
3-Methylcholanthrene	--*	ND	ND
Methyl methanesulfonate	--*	ND	ND
1-Methylnaphthalene	330	ND	ND
1-Naphthylamine	--*	ND	ND
2-Naphthylamine	--*	ND	ND
2-Nitroaniline	1600	ND	ND
3-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
N-Nitroso-di-n-butylamine	--*	ND	ND
N-Nitrosopiperidine	--*	ND	ND
Pentachlorobenzene	--*	ND	ND
Pentachloronitrobenzene	--*	ND	ND
Phenacetin	--*	ND	ND
2-Picoline	--*	ND	ND
Pronamide	--*	ND	ND
1,2,4,5-Tetrachlorobenzene	--*	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

page 4 of 5

Date Received: August 16, 1988
Date Reported: December 9, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN:Mr. Bill Hayden

Lab Number:	88081888	88081890
Sample No.:	DANGB2-MW39- SS1	DANGB2-MW39- SS3
Date Sampled:	8-15-88	8-15-88
Time Sampled:	16:24	17:05
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-03-88	10-03-88
Percent Moisture:	12	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Alpha-BHC	--*	ND	ND
Gamma-BHC	--*	ND	ND
Beta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Aldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
Dieldrin	500	ND	ND
4,4'-DDE	1000	ND	ND
Endrin	--*	ND	ND
Endosulfan II	--*	ND	ND
4,4'-DDD	500	ND	ND
4,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	--*	ND	ND
Endrin Ketone	--*	ND	ND
Chlordane	2000	ND	ND
Methoxychlor	--*	ND	ND
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1246	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

page 5 of 5

Date Received: August 16, 1988
Date Reported: December 9, 1988

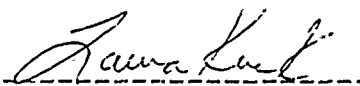
Work Order: 856
Job Number: OR001

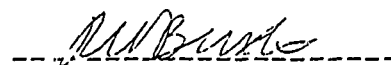
For: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081888	88081890
Sample No.:	DANGB2-MW39- SS1	DANGB2-MW39- SS3
Date Sampled:	8-15-88	8-15-88
Time Sampled:	16:24	17:05
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-03-88	10-03-88
Percent Moisture:	12	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
2-Chlorophenol	330	ND	ND
2-Nitrophenol	330	ND	ND
Phenol	330	ND	ND
2,4-Dimethylphenol	330	ND	ND
2,4-Dichlorophenol	330	ND	ND
2,4,6-Trichlorophenol	330	ND	ND
4-Chloro-3-methylphenol	660	ND	ND
2,4-Dinitrophenol	1600	ND	ND
2,6-Dichlorophenol	--x	ND	ND
2-Methyl-4,6-Dinitrophenol	1600	ND	ND
Pentachlorophenol	1600	ND	ND
4-Nitrophenol	1600	ND	ND
Benzoic Acid	1600	ND	ND
2-Methylphenol	330	ND	ND
3- & 4-Methylphenol	330	ND	ND
2,3,4,6-Tetrachlorophenol	--x	ND	ND
2,4,5-Trichlorophenol	330	ND	ND


Analyst


Laboratory Supervisor

* EPA has not yet determined detection limits for these compounds.

s = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

SEMIVOLATILE METHOD BLANK SUMMARY

4B

Job No.:

Work Order No.:

Client:

Lab Sample No.: 03-55

Attn:

Lab File ID: ES797

Address:

Matrix: Soil

Level (low/med):

Date Analyzed: 10-3-88

Time Analyzed: 17:18

Instrument ID:

Date Reported:

Project: Duluth

This Method Blank applies to the following samples, MS and MSD.

Sample Number	Lab Sample ID	Lab File ID	Date of Analysis
NOT DULUTH	88081869	S0127	9-30-88
NOT DULUTH	88081869 MS	S0128	"
NOT DULUTH	88081869 MSD	S0129	10-01-88
DANG02 - MW37 - SS1	88081883	S0130	"
-SS2	88081884	S0131	"
-SS3	88081885	S0132	"
-SS4	88081886	ES790	10-1-88
-SS5	88081887	ES791, ES815	10-1-88, 10-5-88
DANG02 - MW39 - SS1	88081888	ES792	10-1-88
-SS2	88081889	ES793, ES816	10-1-88, 10-5-88
-SS3	88081890	ES794	10-1-88
_____	BLANK MS	ES795	10-1-88
_____	BLANK MSD	ES796	10-1-88

2829

GC/MS TUNING AND MASS CALIBRATION

Decafluorotriphenylphosphine (DFTPP)

Case No. AD-76

Contractor ENG SCI(9/7/88) Contract No. 99-99-99

Instrument ID #1

Date / Time 9/30/88 14:38

Lab ID >T0930::D1

Data Release Authorized By: 

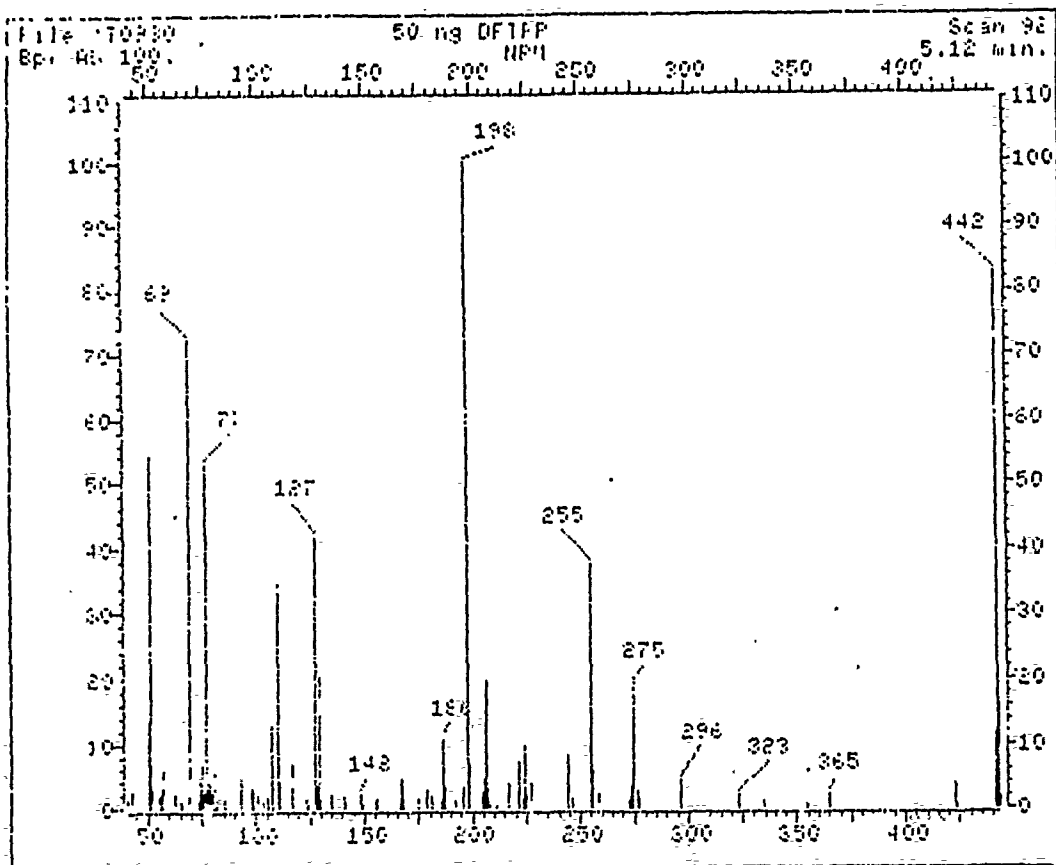
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51	30.0 - 60.0% of mass 198	54.08 OK
69	less than 2.0% of mass 69	0.00 OK (0.00) #1
69	mass 69 relative abundance	72.31
76	less than 2.0% of mass 69	0.00 OK (0.00) #1
127	40.0 - 60.0% of mass 198	41.77 OK
137	less than 1.0% of mass 198	0.00 OK
198	base peak, 100% relative abundance	100.00 OK
199	5.0 - 9.0% of mass 198	7.24 OK
275	10.0 - 30.0% of mass 198	19.20 OK
365	greater than 1.00% of mass 198	2.22 OK
441	present, but less than mass 443	11.74 OK
442	greater than 40.0% of mass 198	82.40 OK
443	17.0 - 23.0% of mass 442	15.87 OK (19.26) #2

THIS PERFORMANCE TUNE APPLIES TO THE
FOLLOWING SAMPLES, BLANKS AND STANDARDS.

#1 - Value in parenthesis is % mass 69.
#2 - Value in parenthesis is % mass 442.

SAMPLE ID	LAB ID	DATE OF ANALYSIS	TIME OF ANALYSIS
SSTD010	S0121	9-30-88	16:20
SSTD025	S0122		17:20
SSTD040	S0123		18:21
SSTD060	S0124		19:21
SSTD080	S0125		20:21
SSTD120	S0126		21:22
88081883	S0130	10/1/88	01:23
88081884	S0131		02:24
88081885	S0132		03:23

initial calibration
all 5 files
9/30/88



File: 70230 Scan: 92 Retn. time: 5.12

m/z	Int.	m/z	Int.	m/z	Int.	m/z	Int.	m/z	Int.
41.00	1.492	79.95	2.395	120.05	3.390	187.00	3.255	254.50	37.485
43.00	2.631	81.05	5.424	128.95	20.857	191.90	1.166	255.90	5.831
50.00	13.453	82.05	1.410	129.95	1.600	196.00	2.983	257.90	2.143
51.00	50.082	83.05	2.061	134.95	2.034	197.90	100.000	272.90	.949
52.00	2.848	85.65	1.302	140.95	1.926	198.90	7.242	273.90	3.526
54.20	1.763	92.95	4.611	141.95	1.085	204.00	2.522	274.90	19.203
56.00	2.197	97.95	3.580	147.95	2.224	205.00	4.394	275.90	2.685
57.00	5.858	98.95	2.929	148.95	.759	206.00	19.555	276.90	1.465
63.05	2.224	101.95	1.983	154.95	1.112	207.00	4.611	295.95	4.421
65.05	1.058	103.95	.949	155.95	1.437	208.00	1.193	322.85	1.980
69.65	72.308	105.05	1.632	165.95	.624	210.90	.841	333.95	1.058
71.05	1.166	106.95	12.992	166.95	4.367	216.90	3.878	353.85	.678
73.05	1.085	110.65	34.391	167.95	1.600	221.00	7.160	364.85	2.224
74.05	4.529	110.95	4.150	174.85	1.383	222.90	1.329	422.90	3.716
75.05	8.977	116.95	6.943	179.00	2.821	224.00	9.574	423.90	.814
76.15	2.522	121.95	.922	180.00	1.654	225.00	2.061	441.00	11.744
77.05	52.807	122.95	1.465	180.90	.976	226.90	3.716	441.90	82.398
78.65	4.123	124.05	.868	185.00	1.221	244.00	8.272	442.90	15.867
79.65	3.876	126.95	41.768	186.00	10.632	245.90	1.492	443.90	1.736

Initial Calibration Data
HSL Compounds

Ass No:

Instrument ID: 1

Contractor: ENGINEERING SCIENCE

Calibration Date: 10/04/88 9/30/88

Contract No:

Minimum RF for SPEC is

Maximum % RSD for ECC is %

Compound	RF	RF	RF	RF	RF	RF	RF	RET	RF	% RSD	ECC	SPEC
Laboratory ID: 50121	50122	50123	50124	50125	50126							
10.00	25.00	40.00	60.00	80.00	120.00	160.00						
Nitrosodimethylamine	1.16660	1.1443	1.13942	1.13075	1.17115	1.26594	-	.443	1.17203	4.522		
2-Fluorophenol	1.37844	1.42155	1.24366	1.29362	.94110	1.02748	-	.392	1.17270	15.667		
1,2-Dichloroethyl ether	1.53769	1.51153	1.51093	1.45119	1.64385	.90263	-	.944	1.42618	18.522		
Freon-1	2.27408	2.17035	2.10109	2.05919	1.99477	1.18190	-	.932	1.17356	20.105		
Freon-1-d5	1.65709	1.94771	1.37873	1.87594	1.78021	1.13217	-	.929	1.74531	17.428		
Aniline	1.66471	1.22301	1.14473	.85326	.87594	.14792	-	.921	.53503	51.253		
2-Chlorophenol	1.51936	1.42045	1.40373	1.42712	1.41732	1.31362	-	.955	1.41694	4.523		
1,3-Dichlorobenzene	1.67631	1.50871	1.40246	1.32052	1.17954	1.11519	-	.989	1.55045	16.199		
1,4-Dichlorobenzene	1.68863	1.40034	1.27132	1.16500	.99923	.90670	-	1.005	1.33754	22.950		
Benzyl Chloride							-					
Benzyl Alcohol	.54049	.64175	.39012	.61868	.69628	.18815	-	1.241	.51257	37.294		
1,2-Dichlorobenzene	1.64106	1.46955	1.54764	1.27325	1.17489	1.07610	-	1.056	1.33038	15.539		
2-Methylphenol	1.53914	2.33653	1.31412	1.47241	1.31863	1.15398	-	1.103	1.52247	27.653		
3,4-Dimethylphenol	1.42832	1.28552	1.17223	1.13132	.89487	1.07599	-	1.146	1.16468	15.640		
1,2-Dichloroisopropyl Ether	2.67953	2.97552	2.93699	2.99790	2.91800	2.84172	-	1.997	2.95887	2.718		
Nitrosodi-n-Propylamine	1.25314	1.12477	1.11182	1.10792	1.06336	1.09175	-	1.154	1.12579	5.955		
Bis(2-chloroethoxy)ethane	.78002	.62001	.45004	.50502	.46552	.42237	-	1.145	.54957	25.203		
Bis(2-chloroisopropoxy)ethane							-					
Nitrobenzene	.58970	.54855	.50701	.51659	.52173	.51244	-	.849	.53273	5.914		
Nitrobenzene-d5	.45283	.44953	.44164	.45545	.44570	.41851	-	.844	.44386	3.013		
2-Nitrophenol	.24151	.23565	.24388	.24165	.23382	.23317	-	.919	.23395	1.852		
Isophorone	1.00332	.97537	1.02342	1.05086	.96917	1.08113	-	.907	1.01721	4.287		
1,2-Dichloroethoxymethane	.61174	.57455	.57360	.57418	.57676	.42545	-	.960	.55604	11.611		
2,4-Dimethylphenol	.24204	.10722	.17389	.30803	.33207	.34694	-	.944	.25170	37.993		
Benzoic Acid	.19061	.26075	.29273	.29717	.33149	.37259	-	.994	.29189	21.118		
2,4-Dichlorophenol	.32333	.35335	.31972	.28921	.16478	.22364	-	.978	.27567	24.456		
1,2,4-Trichlorobenzene	.39856	.37462	.33373	.53044	.31775	.50291	-	.991	.34300	10.572		
Naphthalene	1.08889	.98211	.89205	.83056	.74616	.72029	-	1.005	.87669	16.133		
4-Chloroaniline	.38494	.42115	.41096	.39707	.44234	.53743	-	1.026	.45232	12.760		
Hexachlorobutadiene	.23090	.21444	.19373	.19084	.17246	.17489	-	1.050	.19521	11.599		

(Conc=

RF - Response Factor (Subscript is amount in mg/L)

RET - Average Relative Retention Time (RT Std/RT Istd)

RF - Average Response Factor

% - Percent Relative Standard Deviation

ECC - Calibration Check Compounds (*) SPEC - System Performance Check Compounds (**)

Initial Calibration Data HSL Compounds

Instrument 10:

Calibration Date: ~~10/14/88~~ 9/30/88

000

Maximum % RSC for CC is %

Laboratory ID:	>S0121	>S0122	>S0123	>S0124	>S0125	>S0126	-				
Compound	RF	RF	RF	RF	RF	RF	RF	RF	RF	% RSD	CCC SPEC
2,4-Dichloro-3-Methylphenol	.34742	.40657	.39718	.45083	.46580	.50350	-	1.159	.42389	12.969	*
2-Methylnaphthalene	.62573	.55200	.52557	.51173	.46983	.48225	-	1.167	.52854	10.733	
Hexachlorocyclopentadiene	.38707	.25053	.39519	.37347	.35841	.32627	-	.860	.34042	15.435	**
2,4,6-Trichlorophenol	.32070	.22635	.25699	.25717	.23005	.24021	-	.877	.25973	13.820	*
2,4,5-Trichlorophenol	.43511	.45393	.54038	.35778	.28895	.25986	-	.890	.39752	28.409	
2-Methoxybiphenyl	1.24009	1.16593	1.16733	1.02631	.93470	.74017	-	.889	1.04574	17.790	
2-Chloronaphthalene	1.29815	1.24158	1.19059	1.10850	1.01767	.84988	-	.902	1.12108	14.086	
2-Methoaniline	.59158	.62597	.63035	.68206	.66345	.57653	-	.929	.63030	9.145	
2-Methylnaphthalate	1.50263	1.47333	1.41245	1.24178	1.01037	.84336	-	.969	1.25065	21.066	
2,4-Dinitrotoluene	.39056	.40120	.42033	.41263	.36637	.33897	-	.990	.38319	10.792	
Acenaphthylene	2.05134	1.87305	1.81567	1.52257	1.17765	.96922	-	.973	1.56808	27.089	
3-Nitroaniline	.34462	.54379	.59737	.64543	.63156	.51236	-	1.001	.54586	20.325	
2,4-Dinitrophenol	.11077	.19454	.24537	.27566	.26933	.21596	-	1.019	.21861	28.019	**
Acenaphthene	1.29739	1.18381	1.13413	1.03273	.84577	.69299	-	1.006	1.63114	21.837	*
Bitenzofuran	1.72566	1.61250	1.59196	1.50367	1.30571	1.16090	-	1.033	1.48337	14.240	
2,4-Dinitrotoluene	.33709	.37621	.38610	.36658	.36738	.30801	-	1.046	.36021	8.716	
4-Nitrophenol	-	.14836	.31354	.37117	.36499	.34539	-	1.050	.30575	29.818	**
Fluorene	1.37653	1.15538	1.04600	.97752	.88691	.74288	-	1.092	.82939	21.166	
1-Methylnaphthalate	1.46653	1.21632	1.08264	.84523	.65619	.44021	-	1.094	.98557	33.419	
4-Chlorophenyl-phenylether	.69474	.63747	.60310	.43694	-	.26461	-	1.095	.51538	38.498	
4-Methoaniline	.19381	.34198	.44052	.49454	.45041	.34883	-	1.111	.39018	29.998	
2,4,6-Tribromophenol	.17612	.26551	.36737	.39155	.01977	.37785	-	1.157	.26641	54.996	
1,2-Diphenylhydrazine	-	-	-	-	-	-	-	-	-	-	
Allyl-BHC	-	-	-	-	-	-	-	-	-	-	
Beta-BHC	-	-	-	-	-	-	-	-	-	-	
Gamma-BHC	-	-	-	-	-	-	-	-	-	-	
Delta-BHC	-	-	-	-	-	-	-	-	-	-	
Hexachlor	-	-	-	-	-	-	-	-	-	-	
Allyl-BHC	-	-	-	-	-	-	-	-	-	-	
1,2-Diphenylhydrazine	.53812	.47272	.42715	.32493	.28966	.34809	-	.896	.38344	29.585	*

RF --- Response Factor (Subscript is amount in mg/L)

RT - Average Relative Retention Time (Ai Std/RT Istd)

RF - Average Response Factor

iii. Percent Relative Standard Deviation

CC - Calibration Check Compounds (1) SPC - System Performance Check Compounds (1)

Initial Calibration Data
HSL Compounds

DATE:

Instrument ID:

1

Contractor: ENGINEERING - SCIENCE

Calibration Date: 11/04/88 9/30/88

Contract No:

Minimum RF for SPEC is

Maximum % RSD for CCC is %

Compound	RF	RF	RF	RF	RF	RF	RF	RF	RF	% RSD	CCC	SPEC
Laboratory II: >S0121	RF	>S0122	RF	>S0123	RF	>S0124	RF	>S0125	RF	>S0126	RF	
10.00	25.00	40.00	60.00	80.00	120.00	160.00	RF	RF	RF	RF	RF	RF
4,6-Dimethyl-2-Methylphenol	.12960	.17446	.17033	.15170	.09669	.04540	-	.893	.12806	38.774		
4-Bromobiphenyl-phenylether	.26110	.24954	.22064	.21312	.19178	.18532	-	.942	.21941	13.974		
Hexachlorobenzene	.38086	.35050	.31987	.31008	.29689	.28190	-	.960	.32348	11.284		
Pentachlorophenol	-	.16788	.19451	.21033	.13102	.19076	-	1.058	.17662	17.147		
Phenanthrene	1.14179	1.03083	.91210	.88168	.80272	.80458	-	1.004	.92143	15.190		
Anthracene	1.17790	1.06579	.96647	.86371	.79942	.64734	-	1.010	.91954	20.745		
Di-n-butylphthalate	1.66770	1.56889	1.38584	1.27351	1.21202	.99572	-	1.697	1.35160	18.122		
4,4'-Dibromobiphenyl	2.53534	1.95843	1.64204	1.51300	1.21641	1.09591	-	1.134	1.63499	33.002		
Fluoranthene	1.25013	1.19507	1.06857	.88008	.91634	.83409	-	1.169	1.03393	15.985		
Heptachlor Epoxide	-	-	-	-	-	-	-	-	-	-	-	-
Endosulfan I	-	-	-	-	-	-	-	-	-	-	-	-
4,4'-DDE	-	-	-	-	-	-	-	-	-	-	-	-
Dieldrin	-	-	-	-	-	-	-	-	-	-	-	-
Endrin	-	-	-	-	-	-	-	-	-	-	-	-
4,4'-DDD	-	-	-	-	-	-	-	-	-	-	-	-
Endosulfan II	-	-	-	-	-	-	-	-	-	-	-	-
Endrin Sulfate	-	-	-	-	-	-	-	-	-	-	-	-
4,4'-DDT	-	-	-	-	-	-	-	-	-	-	-	-
Endosulfan Sulfate	-	-	-	-	-	-	-	-	-	-	-	-
Dibutylchloranilate	-	-	-	-	-	-	-	-	-	-	-	-
Benzofluorene	.00576	.00853	.03991	.05757	.11251	.10548	-	.883	.06163	80.207		
Pyrene	1.56985	1.36626	1.33014	1.27424	1.24547	1.35121	-	.877	1.35653	8.412		
Terphenyl-314	1.04794	.97006	.92453	.90032	.86081	.93581	-	.896	.94141	6.720		
Butylbenzylphthalate	.96856	.89682	.84197	.83524	.79665	.84333	-	.951	.86376	7.001		
3,3'-Dichlorobenzidine	.07520	.07751	.13981	.12579	.13868	.19408	-	1.000	.13685	38.781		
Chrysene	1.28007	1.17970	1.15896	1.10358	1.04297	1.02146	-	1.003	1.13112	8.468		
Benzofluorene Anthracene	1.15715	1.12176	1.11766	1.11038	1.13446	1.26643	-	.998	1.15230	5.029		
bis(2-Ethylhexyl)phthalate	1.16263	1.04995	.99376	.93053	.85589	.91919	-	1.013	.98532	11.101		
Di-n-butylphthalate	2.27639	2.23598	2.06508	2.01762	1.79251	1.75332	-	.919	2.03123	10.753		
Benzofluorene Pyrene	1.08665	1.12882	1.06997	1.13292	1.11357	1.06292	-	.992	1.10247	2.473		

RF - Response factor (Subscript is amount in mg/L)

RRT - Average Relative Retention Time (RT Std/RT. Std)

RF - Average Response Factor

%RSD - Percent Relative Standard Deviation

CCC - Calibration Check Compounds (*) SPEC - System Performance Check Compounds (**)

Initial Calibration Data
HSL Compounds

Case No: _____

Instrument ID: 1

Contractor: ENGINEERING-SCIENCE

Calibration Date: 10-27-88 9-30-88

Contract No: _____

Minimum RF for CCC is

Maximum % RSD for CCC is

Compound	Laboratory ID: >S0121 >S0122 >S0123 >S0124 >S0125 >S0126							RRT	RF	% RSD	CCC	SPCC
	RF	RF	RF	RF	RF	RF	RF					
	10.00	25.00	40.00	60.00	80.00	120.00	160.00					
Benzo(a)fluoranthene	1.22783	1.36779	1.30045	1.57776	1.81610	1.79931	-	.954	1.51799	16.648		
Indene(1,2,3-cd)Pyrene	.96500	.96297	.98389	1.01423	1.24715	1.25337	-	1.175	1.06435	13.975		
Dibenz(a,h)Anthracene	1.03847	1.11574	1.10799	1.08268	1.14446	1.15416	-	1.182	1.16725	3.830		
Benzo(k)fluoranthene	1.19507	1.19487	1.08727	.85158	.57804	.54350	-	.957	.90835	32.691		
Benzo(g,h,i)perylene	.94905	1.02944	1.01970	.96164	1.07320	1.06135	-	1.228	1.01906	4.630		

RF - Response Factor (Subscript is amount in mg/L)

RRT - Average Relative Retention Time (RT Std/RT 1std)

RF - Average Response Factor

RSD - Percent Relative Standard Deviation

CCC - Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: Engineering ScienceContract: OR001

Lab Code: _____

Case No.: _____

SAS No.: _____

Job No.: _____

Sample No. (Standard): STD025Date Analyzed: 9/30/88Lab File ID (Standard): 50122Time Analyzed: 17:20Instrument ID: 1

	IS1 (DCB) AREA #	RT	IS2 (NPT) AREA #	RT	IS3 (ANT) AREA #	RT
=====	=====	=====	=====	=====	=====	=====
12 HOUR STD	49324	9.33	179876	12.95	95726	18.46
=====	=====	=====	=====	=====	=====	=====
UPPER LIMIT	96648		359752		191452	
=====	=====	=====	=====	=====	=====	=====
LOWER LIMIT	24162		89938		47863	
=====	=====	=====	=====	=====	=====	=====
EPA SAMPLE NO.						
=====	=====	=====	=====	=====	=====	=====
01 88081883	51005	9.34	209126	12.93	119539	18.44
02 88081884	50644	9.32	197536	12.93	112511	18.44
03 88081885	51350	9.34	212885	12.93	119785	18.44
04						
05						
06						
07						
08						
09						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

IS1 (DCB) = 1,4-Dichlorobenzene-d4

IS2 (NPT) = Naphthalene-d8

IS3 (ANT) = Acenaphthene-d3

UPPER LIMIT = + 100% of
internal standard area.
LOWER LIMIT = - 50% of
internal standard area.

Column used to flag internal standard area values with an asterisk

page ____ of ____

FORM VIII SV-1

2837

10/80

SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: Engineering Science Contract: ORD001
 Lab Code: _____ Case No.: _____ SAS No.: _____ Job No.: _____
 Sample No. (Standard): 9STD025 Date Analyzed: 9/30/88
 Lab File ID (Standard): S0122 Time Analyzed: 17:20
 Instrument ID: _____

	IS4 (PHN)	RT	IS5 (CRY)	RT	IS4 (PRY)	RT
	AREA #		AREA #		AREA #	
=====	=====	=====	=====	=====	=====	=====
12 HOUR STD	<u>170247</u> <u>488</u>	<u>23.10</u>	<u>149176</u>	<u>31.55</u>	<u>123825</u>	<u>37.15</u>
=====	=====	=====	=====	=====	=====	=====
UPPER LIMIT	<u>340494</u>		<u>298352</u>		<u>247650</u>	
=====	=====	=====	=====	=====	=====	=====
LOWER LIMIT	<u>85123</u>		<u>74587</u>		<u>61912</u>	
=====	=====	=====	=====	=====	=====	=====
EPA SAMPLE NO.						
=====	=====	=====	=====	=====	=====	=====
01 <u>88081883</u>	<u>198959</u>	<u>23.10</u>	<u>156750</u>	<u>31.55</u>	<u>126239</u>	<u>37.15</u>
02 <u>88081884</u>	<u>184718</u>	<u>23.10</u>	<u>155759</u>	<u>31.55</u>	<u>126385</u>	<u>37.13</u>
03 <u>88081885</u>	<u>197322</u>	<u>23.08</u>	<u>162866</u>	<u>31.55</u>	<u>132406</u>	<u>37.15</u>
04						
05						
06						
07						
08						
09						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

IS4 (PHN) = Phenanthrene-d10
 IS5 (CRY) = Chrysene-d12
 IS6 (PRY) = Perylene-d12

UPPER LIMIT = + 100%
 of internal standard area.
 LOWER LIMIT = - 50%
 of internal standard area.

Column used to flag internal standard area values with an asterisk

GC/MS TUNING AND MASS CALIBRATION

Decafluorotriphenylphosphine (DFTPP)

Case No. 123456

Contractor Engineering Scien Contract No. 99999999

Instrument ID #1

Date / Time 11/02/88 3:11

Lab ID >T1102::03

Data Release Authorized By: 

m/z	ION ABUNDANCE CRITERIA	%RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	46.07 OK
68	less than 2.0% of mass 69	0.00 OK (0.00) #1
69	mass 69 relative abundance	58.43
70	less than 2.0% of mass 69	0.00 OK (0.00) #1
127	40.0 - 60.0% of mass 198	45.06 OK
197	less than 1.0% of mass 198	0.00 OK
198	base peak, 100% relative abundance	100.00 OK
199	5.0 - 9.0% of mass 198	6.89 OK
275	10.0 - 30.0% of mass 198	16.76 OK
365	greater than 1.00% of mass 198	1.47 OK
441	present, but less than mass 443	6.71 OK
442	greater than 40.0% of mass 198	44.93 OK
443	17.0 - 23.0% of mass 442	9.27 OK (20.64) #2

THIS PERFORMANCE TUNE APPLIES TO THE
FOLLOWING SAMPLES, BLANKS AND STANDARDS.#1 - Value in parenthesis is % mass 69.
#2 - Value in parenthesis is % mass 442.

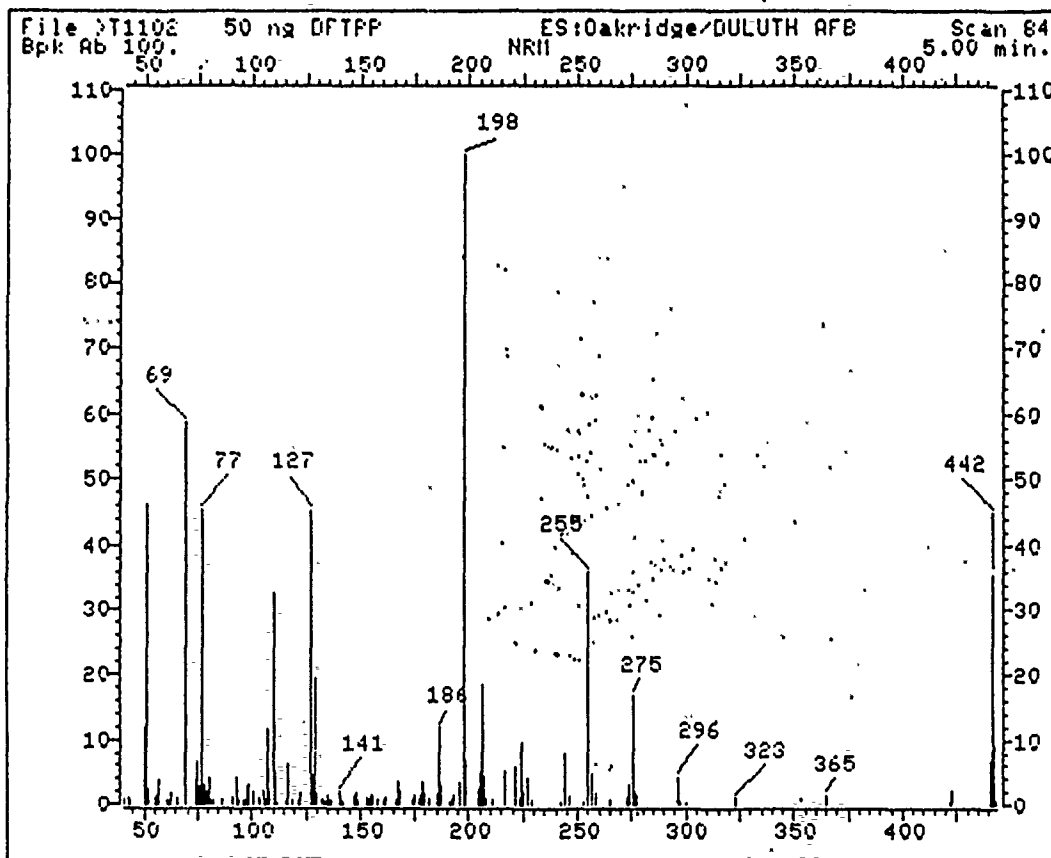
SAMPLE ID	LAB ID	DATE OF ANALYSIS	TIME OF ANALYSIS
50 ng DFTPP	>T1102	11/02/88	3:11
STD C60	S0332		3:38
8808185 9304 REX	S0333		4:38
8808185 REX	S0334		5:37
88082003 REX	S0335		6:37
88082003 REX	S0336		
88083334 REX	S0337		8:36
88082226 REX	S0338		9:35
88082163 REX	S0339		10:34
88082103 MS REX	S0340		11:33
88082103 MS REX	S0341		12:32
88081887 REX	S0342		13:31
88081924 REX	S0343		14:32

FORM U

7/85

2839

10/12/88
SPM



File: >T1102 Scan #: 84 Retn. time: 5.00

m/z	Int.	m/z	Int.	m/z	Int.	m/z	Int.	m/z	Int.
41.10	.893	91.00	1.157	129.05	19.339	175.15	1.421	227.00	4.215
43.20	1.207	93.10	4.231	130.15	1.785	177.15	.777	229.00	.777
43.90	.926	93.80	.529	132.05	.876	178.15	1.438	242.00	.479
50.10	11.851	94.10	.661	133.15	.826	178.95	3.620	244.10	7.752
51.10	46.066	96.10	.810	133.95	.579	180.05	1.901	246.00	1.355
52.10	2.397	97.10	.678	135.05	1.421	181.05	1.058	252.90	.397
55.20	.959	98.00	2.942	135.85	.628	185.05	1.769	255.10	35.752
56.00	1.438	99.10	3.025	136.05	.628	186.05	11.901	256.10	4.843
57.10	3.769	101.10	1.983	137.05	.843	187.05	3.240	258.00	1.901
60.90	.628	104.00	1.124	141.05	2.116	191.15	.413	265.00	.777
61.10	.628	105.10	1.983	142.05	.760	191.95	.711	273.10	1.256
62.00	.529	105.80	.446	142.95	.413	193.15	1.339	274.05	3.041
63.10	1.702	106.20	.645	147.05	1.438	196.10	3.488	275.15	16.760
65.10	1.008	107.10	11.736	148.05	1.835	198.00	100.000	276.05	2.215
69.10	58.430	108.10	2.165	149.05	.628	199.00	6.893	277.05	1.322
74.10	3.868	110.00	32.678	153.15	1.223	204.00	2.496	296.05	4.149
75.10	6.496	111.00	5.058	154.05	.645	205.10	5.140	297.05	.545
76.20	2.694	112.00	.545	155.15	1.339	206.10	18.198	323.15	.975
77.10	45.339	116.00	.744	156.05	1.570	207.10	4.314	365.00	1.471
78.10	3.256	117.00	6.264	158.05	.711	208.10	1.025	422.20	.413
79.10	3.140	119.05	.711	160.15	.694	211.10	.760	423.10	2.165
80.00	1.950	121.95	.628	161.15	1.124	217.10	5.174	441.15	6.711
81.00	4.198	122.15	.661	166.15	.793	221.10	5.868	442.15	44.926
82.10	.777	123.05	1.868	167.05	3.504	223.20	1.008	443.15	9.273
83.10	.893	127.15	45.058	168.05	1.950	224.10	9.570	444.05	.810
86.90	.595	128.15	4.331	173.95	.793	225.10	2.198		

2840

Continuing Calibration Check
HSL Compounds

Case No: _____ Calibration Date: 11/02/88
Contractor: ENGINEERING-SCIENCE Time: 03:38
Contract No: _____ Laboratory ID: >S0332
Instrument ID: 1 Initial Calibration Date: 10/15/88

Minimum RF for SPCC is _____ Maximum % Diff for CCC is %

Compound	RF	RF	%Diff	CCC	SPCC
N-Nitroso-Dimethylamine	.80169	.86829	3.71		
2-Fluorophenol	1.15802	1.24487	7.50		
bis(2-Chloroethyl)ether	1.11892	.94279	15.74		
Phenol	1.41657	1.41675	.01		
Phenol-d5	1.22488	1.35519	10.64		
Aniline	.54193	.55919	3.19		
2-Chlorophenol	1.23175	1.29899	5.46		
1,3-Dichlorobenzene	1.47535	1.41606	4.02		
1,4-Dichlorobenzene	1.40530	1.41814	.91		
Benzyl Chloride	-	-	-		
Benzyl Alcohol	.72906	.35776	50.93		
1,2-Dichlorobenzene	1.32240	1.47223	11.33		
2-Methylphenol	1.17367	1.34088	14.25		
3-6-4-Methylphenol	1.07139	1.36481	27.39		
bis(2-chloroisopropyl)Ether	2.15627	2.39968	11.29		
N-Nitroso-Di-n-Propylamine	.84050	.85968	2.28		
Hexachloroethane	.53840	.55322	2.75		
Dibromochloropropane	-	-	-		
Nitrobenzene	.40312	.44179	9.59		
Nitrobenzene-d5	.39137	.39411	.70		
2-Nitrophenol	.24657	.26596	7.86		
Isophorone	.74170	.77937	5.08		
bis(2-Chloroethoxy)methane	.49386	.51448	4.18		
2,4-Dimethylphenol	.34849	.37602	7.90		
Benzoic Acid	.29725	.26761	9.97		
2,4-Dichlorophenol	.56733	.60488	6.62		
1,2,4-Trichlorobenzene	.36913	.35632	3.47		
Naphthalene	.94589	.91410	3.36		
4-Chloroaniline	.36309	.38411	5.79		
Hexachlorobutadiene	.20283	.19102	5.83		
4-Chloro-3-Methylphenol	.31360	.33164	5.75		
2-Methylnaphthalene	.56397	.59883	6.18		

RF - Response Factor from daily standard file at 60.00 mg/L

RF - Average Response Factor from Initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

Continuing Calibration Check
HSL Compounds

Case No: _____ Calibration Date: 11/02/88
Contractor: ENGINEERING - SCIENCE Time: 03:38
Contract No: _____ Laboratory ID: >S0332
Instrument ID: 1 Initial Calibration Date: 10/13/88

Minimum RF for SPCC is _____ Maximum % Diff for CCC is %

Compound	RF	RF	%Diff	CCC	SPCC
Hexachlorocyclopentadiene	.29568	.28792	2.62		**
2,4,6-Trichlorophenol	.42280	.39006	7.74		*
2,4,5-Trichlorophenol	.52897	.51089	3.42		
2-Fluorobiphenyl	1.27220	1.10949	12.79		
2-Chloronaphthalene	1.23784	1.15731	6.51		
2-Nitroaniline	.47288	.46907	.81		
Dimethylphthalate	1.40629	1.28063	8.94		
2,6-Dinitrotoluene	.37415	.36992	1.13		
Acenaphthylene	1.68918	1.59847	5.37		
3-Nitroaniline	.44557	.44053	1.13		
2,4-Dinitrophenol	.11898	.10237	13.96		**
Acenaphthene	1.13011	.98894	12.49	*	
Dibenzofuran	1.64131	1.52393	7.15		
2,4-Dinitrotoluene	.28418	.27512	3.19		
4-Nitrophenol	.28450	.18656	34.42		**
Fluorene	1.12850	.96772	14.25		
Diethylphthalate	1.20939	1.09078	9.81		
4-Chlorophenyl-phenylether	.59183	.53600	9.43		
4-Nitroaniline	.35956	.24005	33.24		
2,4,6-Tribromophenol	.21023	.18667	11.21		
1,2-Diphenylhydrazine	-	-	-		
Alpha-BHC	-	-	-		
Beta-BHC	-	-	-		
Gamma-BHC	-	-	-		
Delta-BHC	-	-	-		
Heptachlor.	-	-	-		
Aldrin	-	-	-		
N-Nitrosodiphenylamine	.40286	.48142	19.50	*	
4,6-Dinitro-2-Methylphenol	.10514	-	-		
4-Bromophenyl-phenylether	.21301	.22585	6.02		
Hexachlorobenzene	.26273	.26256	.06		
Pentachlorophenol	.14536	.11651	19.85	*	

RF - Response Factor from daily standard file at 60.00-mg/L

RF - Average Response Factor from Initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

Continuing Calibration Check
HSL Compounds

Case No: _____ Calibration Date: 11/02/88
Contractor: ENGINEERING - Science Time: 03:38
Contract No: _____ Laboratory ID: >S0332
Instrument ID: 1 Initial Calibration Date: 10/15/88

Minimum RF for SPCC is

Maximum % Diff for CCC is %

Compound	RF	RF	%Diff	CCC SPCC
Phenanthrene	1.03431	.99397	3.90	
Anthracene	1.05155	1.08324	3.01	
Di-n-Butylphthalate	1.51956	1.57248	3.48	
4,4'-Dibromobiphenyl	-	-	-	
Fluoranthene	1.19047	1.09563	7.97	*
Heptachlor Epoxide	-	-	-	
Endosulfan I	-	-	-	
4,4'-DDE	-	-	-	
Dieldrin	-	-	-	
Endrin	-	-	-	
4,4'-DDD	-	-	-	
Endosulfan II	-	-	-	
Endrin Aldehyde	-	-	-	
4,4'-DDT	-	-	-	
Endosulfan Sulfate	-	-	-	
Dibutylchloroendate	-	-	-	
Benzidine	.04023	.10651	164.75	
Pyrene	1.56086	1.70230	9.06	
Terphenyl-d14	1.05835	1.12088	5.91	
Butylbenzylphthalate	1.03390	1.18805	14.91	
3,3'-Dichlorobenzidine	.13689	.22546	64.70	
Chrysene	.99655	1.07935	8.31	
Benzo(a)Anthracene	1.10407	1.12922	2.28	
bis(2-Ethylhexyl)Phthalate	1.21073	1.41995	17.28	
Di-n-octylphthalate	3.40275	3.35609	1.37	*
Benzo(a)Pyrene	1.32098	1.31300	.60	*
Benzo(b)Fluoranthene	1.60850	1.29493	19.37	
Indeno(1,2,3-cd)Pyrene	.96800	1.07897	11.46	
Dibenzo(a,h)Anthracene	.87481	1.04007	18.89	
Benzo(k)Fluoranthene	1.44370	1.27546	11.65	
Benzo(g,h,i)Perylene	.89761	1.06755	18.93	

RF - Response Factor from daily standard file at 60.00 mg/L

RF - Average Response Factor from Initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

8B
SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: Engineering Science Contract: OR001

Lab Code: _____ Case No.: _____ SAS No.: _____ Job No.: _____

Sample No. (Standard): Std 060

Date Analyzed: 11/2/83

Lab File ID (Standard): S0332

Time Analyzed: 0338

Instrument ID: 1

		IS1 (DCB)	RT	IS2 (NPT)	RT	IS3 (ANT)	RT
		AREA #		AREA #		AREA #	
	12 HOUR STD	64746	9.19	217043	12.82	127196	18.30
	UPPER LIMIT	129492	9.69	434086	13.32	254392	18.80
	LOWER LIMIT	32373	8.69	108522	12.32	63598	17.80
	EPA SAMPLE NO.						
S 0333 01	8808188981REV	65200	9.18	244999	12.73	130426	18.31
S 0334 02	88081899 REV	67988	9.14	249777	12.68	133620	18.32
S 0335 03	88082223REV	66275	9.17	252126	12.73	137935	18.32
S 033704	88082224REV	70289	9.12	258379	12.66	138299	18.31
S 0338 05	88082226REV	60084	9.27	209428	12.85	118495	18.34
S 0339 06	88082163REV	71814	9.11	267332	12.66	140121	18.32
S 034007	88082163MSREV	66067	9.20	263302	12.80	132056	18.29
S 034108	88082163MSREV	59824	9.22	238752	12.82	123902	18.30
S 0341209	88081897REV	62566	9.20	237155	12.82	125428	18.33
S 034310	88081939REV	78132	9.21	308938	12.83	164589	18.31
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							

IS1 (DCB) = 1,4-Dichlorobenzene-d4
IS2 (NPT) = Naphthalene-d8
IS3 (ANT) = Acenaphthene-d8

UPPER LIMIT = + 100% of internal standard area.
LOWER LIMIT = - 50% of internal standard area.

Column used to flag internal standard area values with an asteris

SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: Engineering Science Contract: OR001
 Lab Code: _____ Case No.: _____ SAS No.: _____ Job No.: _____
 Sample No. (Standard): Sd 060 Date Analyzed: 11/2/88
 Lab File ID (Standard): S0332 Time Analyzed: 03:38
 Instrument ID: 1

		IS4 (PHN)	RT	IS5 (CRY)	RT	IS4 (PRY)	RT
		AREA #		AREA #		AREA #	
=====	=====	=====	=====	=====	=====	=====	=====
12 HOUR		187954	22.96	112232	31.43	79141	37.57
STD		=====	=====	=====	=====	=====	=====
UPPER		375908	23.46	224464	31.93	159282	38.07
LIMIT		=====	=====	=====	=====	=====	=====
LOWER		93977	22.46	56116	30.93	39571	37.07
LIMIT		=====	=====	=====	=====	=====	=====
EPA SAMPLE							
NO.							
=====	=====	=====	=====	=====	=====	=====	=====
S0333 01	88081899611 REX	178862	23.00	105803	31.44	61911	37.60
S0334 02	88081899611 REX	173199	22.99	117735	31.43	78788	37.56
S0335 03	88082229 REX	177355	23.02	100187	31.44	57284	37.59
S0337 04	88082224 REX	182323	22.99	110816	31.43	49552	37.58
S0338 05	88082226 REX	169188	23.03	93573	31.47	55951	37.61
S0339 06	88082163 REX	196958	22.99	104037	31.43	61922	37.59
S0340 07	88082163 REX	185761	22.96	111607	31.45	49021	37.59
S0341 08	88082163 REX	175088	22.99	102062	31.47	56668	37.62
S0342 09	88081887 REX	170433	23.00	90356	31.45	50008	37.61
S0343 10	88081939 REX	218764	22.99	119171	31.44	71774	37.59
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							

IS4 (PHN) = Phenanthrene-d10

IS5 (CRY) = Chrysene-d12

IS6 (PRY) = Pyrene-d12

UPPER LIMIT = + 100%
 of internal standard area.
 LOWER LIMIT = - 50%
 of internal standard area.

Column used to flag internal standard area values with an asterisk

STILE CONTINUING CALIBRATION CHECK

Lane: _____ Contract: _____

Code: _____ Case No.: _____ SAS No.: _____

Instrument ID: CARBOPAK _____ Calibration Date(s): 8/23/88

AB FILE ID: 56,57 _____ Init. Calib. Date(s): 8/19/88, 8/15/88

COMPOUND	RRF	RRF50	%D
benzyl chloride	0.08	0.08	-111.57
1,2-dichloroethoxy	0.04		100.00
1,2-dichloroisopropyl	0.26		100.00
1,2-dichlorobenzene	1.21	1.00	8.38
1,2-dichloromethane	3.68	2.72	7.36
1,2-dichloroethane	1.45	0.96	22.94
1,2-dichloroethane	0.26	0.31	15.03
1,2-dichloroethane	3.20	2.83	2.81
1,2-dichloroethane			ERR
1,2-dichloroethane	1.36	1.21	-4.47
1,2-dichloroethane	0.55	0.52	36.02
1,2-dichloroethane	4.50	3.98	4.20
1,2-dichloroethane	0.92	0.73	7.10
1,2-dichloroethyl vinyl ether	0.04		100.00
1,2-dichloromethane	0.34	0.30	-13.85
1,2-dichloromethyl methyl ether	0.17		100.00
1,2-dichloroethane	3.99	3.19	12.09
1,2-dichloromethane	3.90	2.88	9.20
1,2-dichloromethane	2.98	2.34	18.78
1,2-dichlorobenzene	2.48	2.00	3.86
1,2-dichlorobenzene	1.94	2.00	-4.98
1,2-dichlorobenzene	2.47	1.89	7.75
1,2-dichlorodifluoromethane	0.54		100.00
1,2-dichloroethane	1.95	1.72	3.45
1,2-dichloroethane	2.33	1.78	5.04
1,2-dichloroethylene	2.44	2.03	23.18
1,2-dichloroethylene	1.51	1.31	-7.79
1,2-dichloromethane	4.21	3.44	9.52
1,2-dichloropropane	2.70	2.27	-1.01
1,2-dichloropropylene	4.60	3.36	21.17
1,2,2-trichloroethane	6.65	5.76	-1.54
1,1,2-trichloroethane	3.61	2.60	20.06
1,1,2-trichloroethylene	6.65	5.76	-1.50
1,1,2-trichloroethane	2.20	1.66	3.43
1,2-trichloroethane	4.60	3.36	21.09
1,2-trichloroethylene	4.40	3.63	19.52
1,2-trichloroethane	2.19	1.66	14.94
1,2-trichloropropane	3.59	2.38	25.04
1,2-trichloroethylene	1.08	0.94	25.28

ATILE CONTINUING CALIBRATION CHECK

bName:ENGINEERING SCIENCE_____ Contract:_____

Code:_____ Case No.:_____ SAS No.:_____ SDG No.:_____

strument ID.:CARBOPAK Calibration Date(s):8/23/88 _____

FILE ID: RRF 50 56_____

Inl calib = 8/19/88

COMPOUND	RRF	RRF50	%D
benzene	3.10	2.47	-20.23
lorobenzene	5.31	4.50	-13.73
2_Dichlorobenzene	2.44	2.27	-6.96
3_Dichlorobenzene	2.71	2.31	-14.73
4_Dichlorobenzene	2.53	2.23	-11.87
thyl Benzene	3.51	2.47	-29.54
luene	3.47	3.32	-4.20
enes	7.63	7.46	-2.24

TILE CONTINUING CALIBRATION CHECK

Name: _____ Contract: _____

Code: _____ Case No.: _____ SAS No.: _____

Instrument ID: CARBOPAK _____ Calibration Date(s): 8/24/88

8 FILE ID: 73,74, _____ Init. Calib. Date(s): 8/19/88, 8/15/88

POUND	RRF	RRF50	%D
zyl chloride _____ (2-chloroethoxy)	0.08	0.09	-111.57
hane _____ (2-chloroisopropyl)	0.04		100.00
er _____	0.26		100.00
mobenzene _____	1.21	1.08	8.38
modichloromethane _____	3.68	3.08	7.36
moform _____	1.45	0.99	22.94
momethane _____	0.26	0.21	15.03
bon tetrachloride _____	3.20	2.86	2.81
oroacetaldehyde _____			ERR
orobenzene _____	1.36	1.26	-4.47
oroethane _____	0.55	0.40	36.02
oroform _____	4.50	3.96	4.20
orohexane _____	0.92	0.77	7.10
chloroethyl vinyl ether _____	0.04		100.00
oromethane _____	0.34	0.28	-13.85
oromethyl methyl ether _____	0.17		100.00
m, & p-Chlorotoluenes _____	3.99	3.22	12.09
romochloromethane _____	3.90	3.25	9.20
romomethane _____	2.98	2.49	18.78
Dichlorobenzene _____	2.48	2.14	3.86
Dichlorobenzene _____	1.94	1.81	-4.98
Dichlorobenzene _____	2.47	2.07	7.75
chlorodifluoromethane _____	0.54		100.00
Dichloroethane _____	1.95	1.87	3.45
Dichloroethane _____	2.33	2.07	5.04
Dichloroethylene _____	2.44	2.16	23.18
ns_1,2_dichloroethylene _____	1.51	1.57	-7.79
chloromethane _____	4.21	3.56	9.52
Dichloropropane _____	2.70	2.49	-1.01
Dichloropropylene _____	4.60	3.51	21.17
,2,2_Tetrachloroethane _____	6.65	6.44	-1.54
,1,2_Tetrachloroethane _____	3.61	2.70	20.06
nachloroethylene _____	6.65	6.44	-1.50
,1_Trichloroethane _____	2.20	1.91	3.43
,2_Trichloroethane _____	4.60	3.51	21.09
chloroethylene _____	4.40	3.69	19.52
chlorodifluoromethane _____	2.19	1.85	14.94
chloropropene _____	3.59	2.60	25.04
chloroethane _____	1.08	0.79	26.28

LABILE CONTINUING CALIBRATION CHECK

Name:ENGINEERING SCIENCE_____ Contract:_____

Code:_____ Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID.:CARBOPAK Calibration Date(s):8/24/88_____

FILE ID: RRF 50 _73_____

Int cali = 8/19/88

COMPOUND	RRF	RRF50	%D
Benzene_____	3.10	2.59	-16.53
Chlorobenzene_____	5.31	4.69	-11.72
1,2_Dichlorobenzene_____	2.44	2.81	15.27
1,3_Dichlorobenzene_____	2.71	2.81	3.78
1,4_Dichlorobenzene_____	2.53	2.81	11.17
Ethyl Benzene_____	3.51	2.40	-31.62
Toluene_____	3.47	3.53	1.73
Xylenes_____	7.63	7.73	1.25

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DATA PACKAGE #53

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ES**ENGINEERING-SCIENCE, INC.**600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001.00

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the soil samples received
by this laboratory on 8-18-88.Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88081960	DANGB3-SS-A0	8010	8-16-88		8-26-88	8-25-88
88081960	DANGB3-SS-A0	8020	8-16-88		8-26-88	8-24-88
88081961	DANGB3-SS-B1	8010	8-16-88		8-26-88	8-25-88
88081961	DANGB3-SS-B1	8020	8-16-88		8-26-88	8-24-88
88081962	DANGB3-SS-C2	8010	8-16-88		8-26-88	8-24-88
88081962	DANGB3-SS-C2	8020	8-16-88		8-26-88	8-24-88

* If applicable

88-A1-DULU0080 1

A SUBSIDIARY OF THE PARSONS CORPORATION

2853

CL-FRM01

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88081960-88081962
WORK ORDER NO.: 878

These soil samples were received at the ES Berkeley Laboratory on 8-18-88. They were received cold and intact.

ANALYSIS REPORT

WORK ORDER NUMBER: 878
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/18/88

APPROVED BY

NWB
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: mg/Kg, GROUP 8010

	DANGB3-SS-A0	DANGB3-SS-B1	DANGB3-SS-C2
TEST COMPOUND	88081960	88081961	88081962
BENZYL CHLORIDE	ND	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND	ND	ND
BROMOBENZENE	ND	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND
BROMOFORM	ND	ND	ND
BROMOETHANE	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND
CHLORACETALDEHYDE	ND	ND	ND
CHLORAL	ND	ND	ND
CHLOROBENZENE	ND	ND	ND
CHLOROETHANE	ND	ND	ND
CHLOROFORM	0.2B	2.6B	0.2B
1-CHLOROHEXANE	ND	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND	ND
CHLOROMETHANE	ND	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND	ND
CHLOROTOLUENE	ND	ND	ND
DIBROMOCHLOROMETHANE	ND	ND	ND
DIBROMOMETHANE	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND
1,1-DICHLOROETHYLENE	ND	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND	ND
DICHLOROMETHANE	3.4B	5.7B	12B
1,2-DICHLOROPROPANE	ND	ND	ND

ND - Not Detected

TEST COMPOUND	DANGB3-SS-A0 88081960	DANGB3-SS-B1 88081961	DANGB3-SS-C2 88081962
1,3-DICHLOROPROPYLENE	ND	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND	ND
1,1,1,2-TETRACHLOROETHANE	ND	ND	ND
TETRACHLOROETHYLENE	ND	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND
TRICHLOROFLUOROMETHANE	ND	ND	ND
TRICHLOROPROPANE	ND	ND	ND
VINYL CHLORIDE	ND	ND	ND

0 - Not Detected

2856

ANALYSIS REPORT

WORK ORDER NUMBER: 878
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/18/88

APPROVED BY

AWB
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (154)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: mg/Kg, GROUP 8020

	DANGB3-SS-A0	DANGB3-SS-B1	DANGB3-SS-C2
TEST COMPOUND	88081960	88081961	88081962
BENZENE	ND	ND	ND
CHLOROBENZENE	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND
ETHYL BENZENE	ND	ND	ND
TOLUENE	17	4.5	5.5
XYLENES	ND	ND	ND

ND - Not Detected

2857

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: VGC-S-0037-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 8-18-88
Date Prepared: NA
Date Analyzed: 8-30-88
Date Reported: 9-26-88
Dilution Factor: NA
% Moisture: 15.8

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88081898-88081900, 88081904-88081906
88081938-88081942, 88081954-88081962

Laboratory Supervisor Approval:

[Signature]

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits % Recovery
88081938	Halocarbons: 8010									
	1,1-dichloroethane	11.9	ND	11.2	94	9.3	78	19	20	58-124
	Trichloroethene	11.9	ND	10.8	91	10.2	86	6	16	75-110
	Chlorobenzene	11.9	ND	11.2	94	11.4	96	2	21	71-125
88081938	Aromatics: 8020									
	Benzene	11.9	ND	10.2	86	9.9	83	3	26	75-123
	Toluene	11.9	2.1	11.6	80	11.6	80	0	16	79-115
	Chlorobenzene	11.9	ND	10.3	87	9.8	82	5	24	82-112

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

$$\text{Relative Percent Difference (PR)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(\text{MS or MSD}) - \text{SR}}{\text{SA}} \times 100$$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Sample Matrix: Soil
Conc. Unit: mg/KG
Date Reported: 9-26-88

Laboratory Supervisor Approval:

Bill Hayden

Project: Duluth ANGB

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
15	8-26-88	VGC	Carbopack	75-09-2 67-66-3	Dichloromethane Chloroform	3.3 0.2	0.5 0.05	88081898-88081900 88081904-88081906 88081960 8081962
2859								

STILE CONTINUING CALIBRATION CHECK

Name: _____ Contract: _____

Code: _____ Case No.: _____ SAS No.: _____

/ppouqrj1...060

8/24/88

FILE ID: 12,13 _____ Init. Calib. Date(s): 8/14/88 , 8/15/88

FOUND	RRF	RRF50	%D
methyl chloride	0.08	0.10	-30.36
s (2-chloroethoxy)			
chane	0.04		100.00
s (2-chloroisopropyl			
ner	0.26		100.00
mobenzene	1.21	1.07	11.80
monochloromethane	3.68	3.08	16.23
moform	1.45	0.95	34.27
momethane	0.26	0.21	20.31
mon tetrachloride	3.20	3.00	6.38
oroacetaldehyde			ERR
orobenzene	1.36	1.29	4.94
oroethane	0.55	0.39	29.18
oroform	4.50	4.19	6.91
Chlorohexane	0.92	0.73	21.03
Chloroethyl vinyl ether	0.04		100.00
romethane	0.34	0.29	14.69
romethyl methyl ether	0.17		100.00
m, & p-Chlorotoluenes	3.99	3.04	23.77
romochloromethane	3.90	3.19	18.08
romomethane	2.98	2.39	19.74
2_Dichlorobenzene	2.48	2.20	11.11
3_Dichlorobenzene	1.94	1.89	2.39
1_Dichlorobenzene	2.47	2.33	5.55
chlorodifluoromethane	0.54		100.00
1_Dichloroethane	1.95	1.90	2.46
2_Dichloroethane	2.33	2.03	12.68
1_Dichloroethylene	2.44	2.19	10.19
ans_1,2_dichloroethylene	1.51	1.59	-5.37
chloromethane	4.21	3.76	10.63
2_Dichloropropane	2.70	2.34	13.29
3_Dichloropropylene	4.60	3.33	27.60
2,2_Tetrachloroethane	6.65	6.41	3.67
1,2_Tetrachloroethane	3.61	2.61	27.59
trachloroethylene	6.65	6.41	3.61
1,1_Dichloroethane	2.20	1.84	16.37
2-Trichloroethane	4.60	3.33	27.61
chloroethylene	4.40	3.94	10.35
chlorofluoromethane	2.19	1.80	17.69
chloropropane	3.59	2.40	33.19
chloride	1.08	0.64	40.91

LATILE CONTINUING CALIBRATION CHECK

Name:ENGINEERING SCIENCE_____ Contract:_____

Code:_____ Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID.:CARBOPAK Calibration Date(s):8/28/88 _____

FILE ID: RRF 50 __12_____

Initial calib 8/19/88

COMPOUND	RRF	RRF50	%D
benzene_____	3.10	2.96	-4.48
monobenzene_____	5.31	4.87	-8.28
1,2_Dichlorobenzene_____	2.44	2.45	0.60
1,3_Dichlorobenzene_____	2.71	2.81	3.51
1,4_Dichlorobenzene_____	2.53	2.69	6.26
ethyl Benzene_____	3.51	2.57	-26.74
toluene_____	3.47	3.62	4.42
xlenes_____	7.63	7.83	2.64

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DATA PACKAGE #54

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**ENGINEERING-SCIENCE, INC.**600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the soil samples received
by this laboratory on 8-18-88.Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88081943	DANGB3-SS-D5	AS-F	8-17-88		10-16-88	
88081943	DANGB3-SS-D5	BA-I	8-17-88		9-18-88	
88081943	DANGB3-SS-D5	CD-F	8-17-88		9-16-88	
88081943	DANGB3-SS-D5	CR-F	8-17-88		9-16-88	
88081943	DANGB3-SS-D5	HG-C	8-17-88		9-13-88	
88081943	DANGB3-SS-D5	PB-F	8-17-88		10-12-88	
88081943	DANGB3-SS-D5	418.1	8-17-88	9-14-88	9-14-88	
88081943	DANGB3-SS-D5	MOIS	8-17-88		8-29-88	
88081943	DANGB3-SS-D5	8010	8-17-88		8-30-88	8-29-88
88081943	DANGB3-SS-D5	8020	8-17-88		8-30-88	8-29-88
88081943	DANGB3-SS-D5	8080	8-17-88	8-26-88	9-23-88	
88081944	DANGB3-SS-C5	AS-F	8-17-88		10-16-88	
88081944	DANGB3-SS-C5	BA-I	8-17-88		9-18-88	
88081944	DANGB3-SS-C5	CD-F	8-17-88		9-16-88	
88081944	DANGB3-SS-C5	CR-F	8-17-88		9-16-88	
88081944	DANGB3-SS-C5	HG-C	8-17-88		9-13-88	
88081944	DANGB3-SS-C5	PB-F	8-17-88		10-12-88	
88081944	DANGB3-SS-C5	418.1	8-17-88	9-14-88	9-14-88	
88081944	DANGB3-SS-C5	MOIS	8-17-88		8-29-88	
88081944	DANGB3-SS-C5	8010	8-17-88		8-30-88	8-29-88
88081944	DANGB3-SS-C5	8020	8-17-88		8-30-88	8-29-88
88081944	DANGB3-SS-C5	8080	8-17-88	8-26-88	9-23-88	

* If applicable

88-A1-DULU0594 1

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2865

CL-FRM01

**ENGINEERING-SCIENCE, INC.**600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88081945	DANGB3-SS-A4	AS-F	8-17-88		10-16-88	
88081945	DANGB3-SS-A4	BA-I	8-17-88		9-18-88	
88081945	DANGB3-SS-A4	CD-F	8-17-88		9-16-88	
88081945	DANGB3-SS-A4	CR-F	8-17-88		9-16-88	
88081945	DANGB3-SS-A4	HG-C	8-17-88		9-13-88	
88081945	DANGB3-SS-A4	PB-F	8-17-88		10-12-88	
88081945	DANGB3-SS-A4	418.1	8-17-88	9-14-88	9-14-88	
88081945	DANGB3-SS-A4	MOIS	8-17-88		8-29-88	
88081945	DANGB3-SS-A4	8010	8-17-88		8-30-88	8-29-88
88081945	DANGB3-SS-A4	8020	8-17-88		8-30-88	8-29-88
88081945	DANGB3-SS-A4	8080	8-17-88	8-26-88	9-23-88	
88081946	DANGB3-SS-A5	AS-F	8-17-88		10-16-88	
88081946	DANGB3-SS-A5	BA-I	8-17-88		9-18-88	
88081946	DANGB3-SS-A5	CD-F	8-17-88		9-16-88	
88081946	DANGB3-SS-A5	CR-F	8-17-88		9-16-88	
88081946	DANGB3-SS-A5	HG-C	8-17-88		9-13-88	
88081946	DANGB3-SS-A5	PB-F	8-17-88		10-12-88	
88081946	DANGB3-SS-A5	418.1	8-17-88	9-14-88	9-14-88	
88081946	DANGB3-SS-A5	MOIS	8-17-88		8-29-88	
88081946	DANGB3-SS-A5	8010	8-17-88		8-30-88	8-29-88
88081946	DANGB3-SS-A5	8020	8-17-88		8-30-88	8-29-88
88081946	DANGB3-SS-A5	8080	8-17-88	8-26-88	9-23-88	
88081947	DANGB3-SS-Z2	AS-F	8-17-88		10-16-88	
88081947	DANGB3-SS-Z2	BA-I	8-17-88		9-18-88	
88081947	DANGB3-SS-Z2	CD-F	8-17-88		9-16-88	
88081947	DANGB3-SS-Z2	CR-F	8-17-88		9-16-88	
88081947	DANGB3-SS-Z2	HG-C	8-17-88		9-13-88	
88081947	DANGB3-SS-Z2	PB-F	8-17-88		10-12-88	
88081947	DANGB3-SS-Z2	418.1	8-17-88	9-14-88	9-14-88	
88081947	DANGB3-SS-Z2	MOIS	8-17-88		8-29-88	
88081947	DANGB3-SS-Z2	8010	8-17-88		8-30-88	8-30-88
88081947	DANGB3-SS-Z2	8020	8-17-88		8-30-88	8-30-88
88081947	DANGB3-SS-Z2	8080	8-17-88	8-26-88	9-23-88	

* If applicable

88-A1-DULU0594 2

CL-FRM01

**ENGINEERING-SCIENCE, INC.**600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88081948	DANGB3-SS-Y2	AS-F	8-17-88		10-06-88	
88081948	DANGB3-SS-Y2	BA-I	8-17-88		9-18-88	
88081948	DANGB3-SS-Y2	CD-F	8-17-88		9-16-88	
88081948	DANGB3-SS-Y2	CR-F	8-17-88		9-16-88	
88081948	DANGB3-SS-Y2	HG-C	8-17-88		9-13-88	
88081948	DANGB3-SS-Y2	PB-F	8-17-88		10-10-88	
88081948	DANGB3-SS-Y2	418.1	8-17-88	9-14-88	9-14-88	
88081948	DANGB3-SS-Y2	MOIS	8-17-88		8-29-88	
88081948	DANGB3-SS-Y2	8010	8-17-88		8-30-88	
88081948	DANGB3-SS-Y2	8020	8-17-88		8-30-88	
88081948	DANGB3-SS-Y2	8080	8-17-88	8-26-88	9-23-88	
88081949	DANGB3-SS-B2	AS-F	8-17-88		10-06-88	
88081949	DANGB3-SS-B2	BA-I	8-17-88		9-18-88	
88081949	DANGB3-SS-B2	CD-F	8-17-88		9-16-88	
88081949	DANGB3-SS-B2	CR-F	8-17-88		9-16-88	
88081949	DANGB3-SS-B2	HG-C	8-17-88		9-13-88	
88081949	DANGB3-SS-B2	PB-F	8-17-88		10-10-88	
88081949	DANGB3-SS-B2	418.1	8-17-88	9-14-88	9-14-88	
88081949	DANGB3-SS-B2	MOIS	8-17-88		8-29-88	
88081949	DANGB3-SS-B2	8010	8-17-88		8-30-88	
88081949	DANGB3-SS-B2	8020	8-17-88		8-30-88	
88081949	DANGB3-SS-B2	8080	8-17-88	8-26-88	9-23-88	9-26-88
88081950	DANGB3-SS-A2.5	AS-F	8-17-88		10-06-88	
88081950	DANGB3-SS-A2.5	BA-I	8-17-88		9-18-88	
88081950	DANGB3-SS-A2.5	CD-F	8-17-88		9-16-88	
88081950	DANGB3-SS-A2.5	CR-F	8-17-88		9-16-88	
88081950	DANGB3-SS-A2.5	HG-C	8-17-88		9-13-88	
88081950	DANGB3-SS-A2.5	PB-F	8-17-88		10-10-88	
88081950	DANGB3-SS-A2.5	418.1	8-17-88	9-14-88	9-14-88	
88081950	DANGB3-SS-A2.5	MOIS	8-17-88		8-29-88	
88081950	DANGB3-SS-A2.5	8010	8-17-88		8-30-88	8-30-88
88081950	DANGB3-SS-A2.5	8020	8-17-88		8-30-88	8-30-88
88081950	DANGB3-SS-A2.5	8080	8-17-88	8-26-88	9-23-88	

* If applicable



ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88081951	DANGB3-SS-A3.5	AS-F	8-17-88		10-06-88	
88081951	DANGB3-SS-A3.5	BA-I	8-17-88		9-18-88	
88081951	DANGB3-SS-A3.5	CD-F	8-17-88		9-16-88	
88081951	DANGB3-SS-A3.5	CR-F	8-17-88		9-16-88	
88081951	DANGB3-SS-A3.5	HG-C	8-17-88		9-13-88	
88081951	DANGB3-SS-A3.5	PB-F	8-17-88		10-10-88	
88081951	DANGB3-SS-A3.5	418.1	8-17-88	9-14-88	9-14-88	
88081951	DANGB3-SS-A3.5	MOIS	8-17-88		8-29-88	
88081951	DANGB3-SS-A3.5	8010	8-17-88		8-30-88	8-30-88
88081951	DANGB3-SS-A3.5	8020	8-17-88		8-30-88	
88081951	DANGB3-SS-A3.5	8080	8-17-88	8-26-88	9-23-88	
88081952	DANGB3-SS-D2	AS-F	8-17-88		10-06-88	
88081952	DANGB3-SS-D2	BA-I	8-17-88		9-18-88	
88081952	DANGB3-SS-D2	CD-F	8-17-88		9-16-88	
88081952	DANGB3-SS-D2	CR-F	8-17-88		9-16-88	
88081952	DANGB3-SS-D2	HG-C	8-17-88		9-13-88	
88081952	DANGB3-SS-D2	PB-F	8-17-88		10-10-88	
88081952	DANGB3-SS-D2	418.1	8-17-88	9-14-88	9-14-88	
88081952	DANGB3-SS-D2	MOIS	8-17-88		8-29-88	
88081952	DANGB3-SS-D2	8010	8-17-88		8-30-88	8-30-88
88081952	DANGB3-SS-D2	8020	8-17-88		8-30-88	
88081952	DANGB3-SS-D2	8080	8-17-88	8-26-88	9-23-88	9-26-88
88081953	DANGB3-SS-D4	AS-F	8-17-88		10-06-88	
88081953	DANGB3-SS-D4	BA-I	8-17-88		9-18-88	
88081953	DANGB3-SS-D4	CD-F	8-17-88		9-16-88	
88081953	DANGB3-SS-D4	CR-F	8-17-88		9-16-88	
88081953	DANGB3-SS-D4	HG-C	8-17-88		9-13-88	
88081953	DANGB3-SS-D4	PB-F	8-17-88		10-12-88	
88081953	DANGB3-SS-D4	418.1	8-17-88	9-14-88	9-14-88	
88081953	DANGB3-SS-D4	MOIS	8-17-88		8-29-88	
88081953	DANGB3-SS-D4	8010	8-17-88		8-30-88	8-30-88
88081953	DANGB3-SS-D4	8020	8-17-88		8-30-88	
88081953	DANGB3-SS-D4	8080	8-17-88	8-26-88	9-23-88	

* If applicable

**ENGINEERING-SCIENCE, INC.**600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88081954	DANGB3-SS-A3	AS-F	8-16-88		10-06-88	
88081954	DANGB3-SS-A3	BA-I	8-16-88		9-18-88	
88081954	DANGB3-SS-A3	CD-F	8-16-88		9-16-88	
88081954	DANGB3-SS-A3	CR-F	8-16-88		9-16-88	
88081954	DANGB3-SS-A3	HG-C	8-16-88		9-13-88	
88081954	DANGB3-SS-A3	PB-F	8-16-88		10-12-88	
88081954	DANGB3-SS-A3	418.1	8-16-88	9-14-88	9-14-88	
88081954	DANGB3-SS-A3	MOIS	8-16-88		8-29-88	
88081954	DANGB3-SS-A3	8010	8-16-88		8-29-88	8-29-88
88081954	DANGB3-SS-A3	8020	8-16-88		8-29-88	8-29-88
88081954	DANGB3-SS-A3	8080	8-16-88	8-26-88	9-23-88	
88081955	DANGB3-SS-A1	AS-F	8-16-88		10-06-88	
88081955	DANGB3-SS-A1	BA-I	8-16-88		9-18-88	
88081955	DANGB3-SS-A1	CD-F	8-16-88		9-16-88	
88081955	DANGB3-SS-A1	CR-F	8-16-88		9-16-88	
88081955	DANGB3-SS-A1	HG-C	8-16-88		9-13-88	
88081955	DANGB3-SS-A1	PB-F	8-16-88		10-12-88	
88081955	DANGB3-SS-A1	418.1	8-16-88	9-14-88	9-14-88	
88081955	DANGB3-SS-A1	MOIS	8-16-88		8-29-88	
88081955	DANGB3-SS-A1	8010	8-16-88		8-30-88	8-29-88
88081955	DANGB3-SS-A1	8020	8-16-88		8-29-88	8-29-88
88081955	DANGB3-SS-A1	8080	8-16-88	8-26-88	9-23-88	
88081956	DANGB3-SS-C0	AS-F	8-16-88		10-06-88	
88081956	DANGB3-SS-C0	BA-I	8-16-88		9-18-88	
88081956	DANGB3-SS-C0	CD-F	8-16-88		9-16-88	
88081956	DANGB3-SS-C0	CR-F	8-16-88		9-16-88	
88081956	DANGB3-SS-C0	HG-C	8-16-88		9-13-88	
88081956	DANGB3-SS-C0	PB-F	8-16-88		10-12-88	
88081956	DANGB3-SS-C0	418.1	8-16-88	9-14-88	9-14-88	
88081956	DANGB3-SS-C0	MOIS	8-16-88		8-29-88	
88081956	DANGB3-SS-C0	8010	8-16-88		8-29-88	8-29-88
88081956	DANGB3-SS-C0	8020	8-16-88		8-29-88	8-29-88
88081956	DANGB3-SS-C0	8080	8-16-88	8-26-88	9-23-88	

* If applicable

**ENGINEERING-SCIENCE, INC.**600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88081957	DANGB3-SS-C1	AS-F	8-16-88		10-06-88	
88081957	DANGB3-SS-C1	BA-I	8-16-88		9-18-88	
88081957	DANGB3-SS-C1	CD-F	8-16-88		9-16-88	
88081957	DANGB3-SS-C1	CR-F	8-16-88		9-16-88	
88081957	DANGB3-SS-C1	HG-C	8-16-88		9-13-88	
88081957	DANGB3-SS-C1	PB-F	8-16-88		10-12-88	
88081957	DANGB3-SS-C1	418.1	8-16-88	9-14-88	9-14-88	
88081957	DANGB3-SS-C1	MOIS	8-16-88		8-29-88	
88081957	DANGB3-SS-C1	8010	8-16-88		8-29-88	8-29-88
88081957	DANGB3-SS-C1	8020	8-16-88		8-29-88	8-29-88
88081957	DANGB3-SS-C1	8080	8-16-88	8-26-88	9-23-88	9-26-88
88081958	DANGB3-SS-C3	AS-F	8-16-88		10-06-88	
88081958	DANGB3-SS-C3	BA-I	8-16-88		9-18-88	
88081958	DANGB3-SS-C3	CD-F	8-16-88		9-16-88	
88081958	DANGB3-SS-C3	CR-F	8-16-88		9-16-88	
88081958	DANGB3-SS-C3	HG-C	8-16-88		9-13-88	
88081958	DANGB3-SS-C3	PB-F	8-16-88		10-12-88	
88081958	DANGB3-SS-C3	418.1	8-16-88	9-14-88	9-14-88	
88081958	DANGB3-SS-C3	MOIS	8-16-88		8-29-88	
88081958	DANGB3-SS-C3	8010	8-16-88		8-29-88	8-29-88
88081958	DANGB3-SS-C3	8020	8-16-88		8-29-88	8-29-88
88081958	DANGB3-SS-C3	8080	8-16-88	8-26-88	9-23-88	
88081959	DANGB3-SS-A2	AS-F	8-16-88		10-06-88	
88081959	DANGB3-SS-A2	BA-I	8-16-88		9-18-88	
88081959	DANGB3-SS-A2	CD-F	8-16-88		9-16-88	
88081959	DANGB3-SS-A2	CR-F	8-16-88		9-16-88	
88081959	DANGB3-SS-A2	HG-C	8-16-88		9-13-88	
88081959	DANGB3-SS-A2	PB-F	8-16-88		10-12-88	
88081959	DANGB3-SS-A2	418.1	8-16-88	9-14-88	9-14-88	
88081959	DANGB3-SS-A2	MOIS	8-16-88		8-29-88	
88081959	DANGB3-SS-A2	8010	8-16-88		8-29-88	8-29-88
88081959	DANGB3-SS-A2	8020	8-16-88		8-29-88	8-29-88
88081959	DANGB3-SS-A2	8080	8-16-88	8-26-88	9-23-88	

* If applicable

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88081943-88081959
WORK ORDER NO.: 877

These soil samples were received at the ES Berkeley Laboratory on 8-18-88. They were received cold and intact.

11/09/88

ANALYSIS REPORT

DRK ORDER NUMBER: 877
JB NUMBER : Z80000000440
DRK ORDER DATE : 08/18/88

APPROVED BY

Lab Supervisor

REPORT DATA:

5 OAK RIDGE/DULUTH ANGB
10 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:

ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

ASK: 2, UNITS: mg/Kg

	DANGB3-SS-D5	DANGB3-SS-C5	DANGB3-SS-A4	DANGB3-SS-A5	DANGB3-SS-Z2	DANGB3-SS-Y2
TEST COMPOUND	88081943	88081944	88081945	88081946	88081947	88081948
---	---	---	---	---	---	---
TOXIC DIG SOIL	NA	NA	NA	NA	NA	NA
ARSENIC	<5.0E	<5.0E	<5.0E	<5.0E	<5.0E	<5.0E
LEAD	56.4	109	70.3	114	62.5	110
CADMIUM	10.9N	5.6N	7.8N	6.2N	13.5N	19.4N
CHROMIUM	19.2	18.9	24.4	22.8	36.2	44.2
MERCURY	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
COBALT	9.3	9.9S	8.2	30.3	9.0	12.6

IA - Not Analyzed

D - Not Detected

2872

11/09/88

ANALYSIS REPORT FOR WORK ORDER NUMBER 877

ASK: 2, UNITS: mg/Kg

DANGB3-SS-B2 DANGB3-SS-A2.5 DANGB3-SS-A3.5 DANGB3-SS-D2 DANGB3-SS-D4 DANGB3-SS-A3

TEST COMPOUND

88081949

88081950

88081951

88081952

88081953

88081954

ACID DIG SOIL

NA

NA

NA

NA

NA

NA

ARSENIC

<5.0E

<5.0E

<5.0E

<5.0E

<5.0E

<5.0E

BARIUM

85.1

69.0

63.9

38.0

44.8

69.4

CADMIUM

12.5N

10.9N

11.6N

10.6N

12.0N

12.5N

CHROMIUM

26.8

28.5

34.8

20.2

30.2

30.5

MERCURY

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

LEAD

13.4

8.0

8.5

17.8

9.1S

12.7S

NA - Not Analyzed

ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 877

ASK: 2, UNITS: mg/Kg

	DANGB3-SS-A1	DANGB3-SS-CO	DANGB3-SS-C1	DANGB3-SS-C3	DANGB3-SS-A2
EST COMPOUND	88081955	88081956	88081957	88081958	88081959
----	----	----	----	----	----
CHD DIG SOIL	NA	NA	NA	NA	NA
ARSENIC	<5.0E	<5.0E	<5.0E	<5.0E	<5.0E
ARIUM	73.7	73.7	73.8	50.8	79.0
DIUM	12.9N	9.7N	16.4N	10.3N	12.3N
FROMIUM	38.1	24.6	31.4	30.1	26.9
MERCURY	<0.1	<0.1	<0.1	<0.1	<0.1
LEAD	7.7	7.7	12.6	10.8S	3.8

NA - Not Analyzed
D - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 877
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/18/88

APPROVED BY *Bill Hayden*
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 3, UNITS: mg/Kg

	DANGB3-SS-D5	DANGB3-SS-C5	DANGB3-SS-A4	DANGB3-SS-A5	DANGB3-SS-Z2	DANGB3-SS-Y2
TEST COMPOUND	88081943	88081944	88081945	88081946	88081947	88081948
18.1 PETROLEUM HYDROCARBONS	<100	150	<100	100	<100	<100
% MOISTURE	16.9	28.7	11.2	56.1	13.1	21.2

ND - Not Detected

11/09/88

ANALYSIS REPORT FOR WORK ORDER NUMBER 877

ASK: 3, UNITS: mg/Kg

	DANGB3-SS-B2	DANGB3-SS-A2.5	DANGB3-SS-A3.5	DANGB3-SS-D2	DANGB3-SS-D4	DANGB3-SS-A3
TEST COMPOUND	88081949	88081950	88081951	88081952	88081953	88081954
18.1 PETROLEUM HYDROCARBONS	<100	<100	<100	<100	83	<100
MOISTURE	24.9	14.3	13.8	5.9	12.0	14.4

- Not Detected

2876

ANALYSIS REPORT FOR WORK ORDER NUMBER 877

TASK: 3, UNITS: mg/Kg

	DANGB3-SS-A1	DANGB3-SS-CO	DANGB3-SS-C1	DANGB3-SS-C3	DANGB3-SS-A2
TEST COMPOUND	88081955	88081956	88081957	88081958	88081959
18.1 PETROLEUM HYDROCARBONS	<100	<100	75	<100	<100
MOISTURE	14.2	14.5	21.1	11.3	17.7

ND - Not Detected

ANALYSIS REPORT

ORK ORDER NUMBER: 877
OB NUMBER : Z80000000440
RK ORDER DATE : 08/18/88

APPROVED BY

[Signature]
Lab Supervisor

REPORT DATA:
S OAK RIDGE/DULUTH ANGB
10 S. ILLINOIS AVE. STE. S103
1K RIDGE, TN 37830
ILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

ONTRACT / PO # : OR001
ONTACT : BILL HAYDEN
(615)-481-3920

ASK: 4, UNITS: ug/Kg, GROUP 8010

	DANGB3-SS-D5	DANGB3-SS-C5	DANGB3-SS-A4	DANGB3-SS-A5	DANGB3-SS-Z2	DANGB3-SS-Y2
EST COMPOUND	88081943	88081944	88081945	88081946	88081947	88081948
ENZYL CHLORIDE	ND	ND	ND	ND	ND	ND
(2-CHLOROETHOXY)METHANE	ND	ND	ND	ND	ND	ND
S (2-CHLOROISOPROPYL)ETHER	ND	ND	ND	ND	ND	ND
ROMOBENZENE	ND	ND	ND	ND	ND	ND
ROMODICHLOROMETHANE	ND	ND	ND	ND	ND	ND
ROMOFORM	ND	ND	ND	ND	ND	ND
ROMOETHANE	ND	ND	ND	ND	ND	ND
ARBON TETRACHLORIDE	ND	ND	ND	ND	ND	ND
ILORACETALDEHYDE	ND	ND	ND	ND	ND	ND
ILORAL	ND	ND	ND	ND	ND	ND
ILOROBENZENE	ND	ND	ND	ND	ND	ND
ILOROETHANE	ND	ND	ND	ND	ND	ND
ILOROFORM	0.5	ND	0.7	0.2	ND	ND
-CHLOROHEXANE	ND	ND	ND	ND	ND	ND
-CHLOROETHYL VINYL ETHER	ND	ND	ND	ND	ND	ND
ILOROMETHANE	ND	ND	ND	ND	ND	ND
ILOROMETHYL METHYL ETHER	ND	ND	ND	ND	ND	ND
ILOROTOLUENE	ND	ND	ND	ND	ND	ND
BROMOCHLOROMETHANE	ND	ND	ND	ND	ND	ND
BROMOMETHANE	ND	ND	ND	ND	ND	ND
,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
CHLORODIFLUOROMETHANE	ND	ND	ND	ND	ND	ND
,1-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
,2-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
,1-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
ANS-1,2-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
CHLOROMETHANE	5.8B	11B	5.5B	25B	9.1B	ND
2-DICHLOROPROPANE	ND	ND	ND	ND	ND	ND

) - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 877.

TEST COMPOUND	DANGB3-SS-D5 88081943	DANGB3-SS-C5 88081944	DANGB3-SS-A4 88081945	DANGB3-SS-A5 88081946	DANGB3-SS-Z2 88081947	DANGB3-SS-Y2 88081948
1,3-DICHLOROPROPYLENE	ND	ND	ND	ND	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1,1,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
TETRACHLOROETHYLENE	ND	ND	ND	ND	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
TRICHLOROFLUOROMETHANE	ND	ND	ND	ND	ND	ND
TRICHLOROPROPANE	ND	ND	ND	ND	ND	ND
VINYL CHLORIDE	ND	ND	ND	ND	ND	ND

ND - Not Detected

ASK: 4, UNITS: ug/Kg, GROUP 8010

- Not Detected

11/09/88

ANALYSIS REPORT FOR WORK ORDER NUMBER 877

TASK: 4, UNITS: ug/Kg, GROUP 8010

	DANGB3-SS-A1	DANGB3-SS-CO	DANGB3-SS-C1	DANGB3-SS-C3	DANGB3-SS-A2
TEST COMPOUND	88081955	88081956	88081957	88081958	88081959
BENZYL CHLORIDE	ND	ND	ND	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND	ND	ND	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND	ND	ND	ND	ND
BROMOBENZENE	ND	ND	ND	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND	ND	ND
BROMOFORM	ND	ND	ND	ND	ND
BROMOETHANE	ND	ND	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND	ND	ND
CHLORACETALDEHYDE	ND	ND	ND	ND	ND
CHLORAL	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND
CHLOROETHANE	ND	ND	ND	ND	ND
CHLOROFORM	ND	ND	ND	ND	ND
1-CHLOROHEXANE	ND	ND	ND	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND	ND	ND	ND
CHLOROMETHANE	ND	ND	ND	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND	ND	ND	ND
CHLOROTOLUENE	ND	ND	ND	ND	ND
DIBROMOCHLOROMETHANE	ND	ND	ND	ND	ND
DIBROMOMETHANE	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND	ND	ND
1,1-DICHLOROETHYLENE	ND	ND	ND	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND	ND	ND	ND
DICHLOROMETHANE	8.8B	3.9B	1.9B	1.7B	2.0B
1,2-DICHLOROPROPANE	ND	ND	ND	ND	ND
1,3-DICHLOROPROPYLENE	ND	ND	ND	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND
1,1,1,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND
TETRACHLOROETHYLENE	ND	ND	ND	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND	ND	ND
TRICHLOROFLUOROMETHANE	ND	ND	ND	ND	ND
TRICHLOROPROPANE	ND	ND	ND	ND	ND
VINYL CHLORIDE	ND	ND	ND	ND	ND

ND - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 877
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/18/88

APPROVED BY *Bill Hayden*
Lab Supervisor

REPORT DATA:
OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

NO OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

ASK: 4, UNITS: ug/Kg, GROUP 8020

	DANGB3-SS-D5	DANGB3-SS-C5	DANGB3-SS-A4	DANGB3-SS-A5	DANGB3-SS-Z2	DANGB3-SS-Y2
TEST COMPOUND	88081943	88081944	88081945	88081946	88081947	88081948
-----	-----	-----	-----	-----	-----	-----
BENZENE	ND	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
ETHYL BENZENE	ND	ND	ND	ND	ND	ND
TOLUENE	12	190	ND	39	12	ND
XYLENES	ND	ND	ND	ND	ND	ND

- Not Detected

11/09/88

ANALYSIS REPORT FOR WORK ORDER NUMBER 877

TASK: 4, UNITS: ug/Kg, GROUP 8020

DANGB3-SS-B2 DANGB3-SS-A2.5 DANGB3-SS-A3.5 DANGB3-SS-D2 DANGB3-SS-D4 DANGB3-SS-A3

TEST COMPOUND

88081949

88081950

88081951

88081952

88081953

88081954

BENZENE

ND

ND

ND

ND

ND

ND

CHLOROBENZENE

ND

ND

ND

ND

ND

ND

1,2-DICHLOROBENZENE

ND

ND

ND

ND

ND

ND

1,3-DICHLOROBENZENE

ND

ND

ND

ND

ND

ND

1,4-DICHLOROBENZENE

ND

ND

ND

ND

ND

ND

ETHYL BENZENE

ND

ND

ND

ND

ND

ND

TOLUENE

ND

11

ND

ND

8.6

12

XYLENES

ND

ND

ND

ND

ND

ND

ND - Not Detected

2883

11/09/88

ANALYSIS REPORT FOR WORK ORDER NUMBER 877

ASK: 4, UNITS: ug/Kg, GROUP 8020

	DANGB3-SS-A1	DANGB3-SS-C0	DANGB3-SS-C1	DANGB3-SS-C3	DANGB3-SS-A2
TEST COMPOUND	88081955	88081956	88081957	88081958	88081959
-----	-----	-----	-----	-----	-----
BENZENE	ND	ND	ND	ND	ND
MONOCHLOROBENZENE	ND	ND	ND	ND	ND
2-DICHLOROBENZENE	ND	ND	ND	ND	ND
3-DICHLOROBENZENE	ND	ND	ND	ND	ND
4-DICHLOROBENZENE	ND	ND	ND	ND	ND
ETHYL BENZENE	ND	ND	ND	ND	ND
TOLUENE	8.5	6.7	8.1	4.2	3.4
XYLENES	ND	ND	ND	ND	ND

- Not Detected

2384

11/09/88

ANALYSIS REPORT

WORK ORDER NUMBER: 877
 JOB NUMBER : ZB0000000440
 WORK ORDER DATE : 08/18/88

APPROVED BY


 Lab Supervisor

REPORT DATA:
 ES OAK RIDGE/DULUTH ANGB
 710 S. ILLINOIS AVE. STE. S103
 OAK RIDGE, TN 37830
 BILL HAYDEN

CLIENT DATA:
 ES OAK RIDGE/DULUTH ANGB (134)
 710 S. ILLINOIS AVE. STE. S103
 OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
 CONTACT : BILL HAYDEN
 (615)-481-3920

TASK: 4, UNITS: ug/Kg, GROUP 8080

	DANGB3-SS-D5	DANGB3-SS-C5	DANGB3-SS-A4	DANGB3-SS-A5	DANGB3-SS-Z2	DANGB3-SS-Y2
TEST COMPOUND	88081943	88081944	88081945	88081946	88081947	88081948
ALDRIN	ND	ND	ND	ND	ND	ND
ALPHA-BHC	ND	ND	ND	ND	ND	ND
BETA-BHC	ND	ND	ND	ND	ND	ND
DELTA-BHC	ND	ND	ND	ND	ND	ND
GAMMA-BHC	ND	ND	ND	ND	ND	ND
CHLORDANE	ND	ND	ND	ND	ND	ND
4,4'-DDD	ND	ND	ND	ND	ND	ND
4,4'-DDE	ND	ND	ND	ND	ND	ND
4,4'-DDT	ND	ND	ND	ND	ND	ND
DIELDRIN	ND	ND	ND	ND	ND	ND
ENDOSULFAN I	ND	ND	ND	ND	ND	ND
ENDOSULFAN II	ND	ND	ND	ND	ND	ND
ENDOSULFAN SULFATE	ND	ND	ND	ND	ND	ND
ENDRIN	ND	ND	ND	ND	ND	ND
ENDRIN ALDEHYDE	NA	NA	NA	NA	NA	NA
HEPTACHLOR	ND	ND	ND	ND	ND	ND
HEPTACHLOR EPOXIDE	ND	ND	ND	ND	ND	ND
KEPONE	NA	NA	NA	NA	NA	NA
METHOXYCHLOR	ND	ND	ND	ND	ND	ND
OXAPHENE	ND	ND	ND	ND	ND	ND
CB-1016	ND	ND	ND	ND	ND	ND
PCB-1221	ND	ND	ND	ND	ND	ND
PCB-1232	ND	ND	ND	ND	ND	ND
CB-1242	ND	ND	ND	ND	ND	ND
CB-1248	ND	ND	ND	ND	ND	ND
PCB-1254	ND	ND	ND	ND	ND	ND
CB-1260	ND	ND	ND	ND	ND	ND

NA - Not Analyzed

ND - Not Detected

11/09/88

ANALYSIS REPORT FOR WORK ORDER NUMBER 877

ASK: 4, UNITS: ug/Kg, GROUP 8080

	DANGB3-SS-B2	DANGB3-SS-A2.5	DANGB3-SS-A3.5	DANGB3-SS-D2	DANGB3-SS-D4	DANGB3-SS-A3
TEST COMPOUND	88081949	88081950	88081951	88081952	88081953	88081954
DRIN	ND	ND	ND	ND	ND	ND
PHA-BHC	ND	ND	ND	ND	ND	ND
TA-BHC	ND	ND	ND	ND	ND	ND
LTA-BHC	ND	ND	ND	ND	ND	ND
MMA-BHC	ND	ND	ND	ND	ND	ND
LORDANE	ND	ND	ND	ND	ND	ND
4'-DDD	ND	ND	ND	ND	ND	ND
4'-DDE	ND	ND	ND	ND	ND	ND
4'-DDT	28	ND	ND	24	ND	ND
ELDRIN	ND	ND	ND	ND	ND	ND
DOSULFAN I	ND	ND	ND	ND	ND	ND
DOSULFAN II	ND	ND	ND	ND	ND	ND
DOSULFAN SULFATE	ND	ND	ND	ND	ND	ND
DRIN	ND	ND	ND	ND	ND	ND
DRIN ALDEHYDE	NA	NA	NA	NA	NA	NA
PTACHLOR	ND	ND	ND	ND	ND	ND
PTACHLOR EPOXIDE	ND	ND	ND	ND	ND	ND
PONE	NA	NA	NA	NA	NA	NA
THOXYCHLOR	ND	ND	ND	ND	ND	ND
XAPHENE	ND	ND	ND	ND	ND	ND
B-1016	ND	ND	ND	ND	ND	ND
B-1221	ND	ND	ND	ND	ND	ND
B-1232	ND	ND	ND	ND	ND	ND
B-1242	ND	ND	ND	ND	ND	ND
B-1248	ND	ND	ND	ND	ND	ND
B-1254	ND	ND	ND	ND	ND	ND
B-1260	ND	ND	ND	ND	ND	ND

A - Not Analyzed

- Not Detected

11/09/88

ANALYSIS REPORT FOR WORK ORDER NUMBER 877

TASK: 4, UNITS: ug/Kg, GROUP 8080

	DANGB3-SS-A1	DANGB3-SS-CO	DANGB3-SS-C1	DANGB3-SS-C3	DANGB3-SS-A2
TEST COMPOUND	88081955	88081956	88081957	88081958	88081959
ALDRIN	ND	ND	ND	ND	ND
ALPHA-BHC	ND	ND	ND	ND	ND
BETA-BHC	ND	ND	ND	ND	ND
DELTA-BHC	ND	ND	ND	ND	ND
GAMMA-BHC	ND	ND	ND	ND	ND
CHLORDANE	ND	ND	ND	ND	ND
4,4'-DDD	ND	ND	ND	ND	ND
4,4'-DDE	ND	ND	37	ND	ND
4,4'-DDT	ND	ND	63	ND	ND
DIELDRIN	ND	ND	ND	ND	ND
ENDOSULFAN I	ND	ND	ND	ND	ND
ENDOSULFAN II	ND	ND	ND	ND	ND
ENDOSULFAN SULFATE	ND	ND	ND	ND	ND
ENDRIN	ND	ND	ND	ND	ND
ENDRIN ALDEHYDE	NA	NA	NA	NA	NA
HEPTACHLOR	ND	ND	ND	ND	ND
HEPTACHLOR EPOXIDE	ND	ND	ND	ND	ND
KEPONE	NA	NA	NA	NA	NA
METHOXYCHLOR	ND	ND	ND	ND	ND
TOXAPHENE	ND	ND	ND	ND	ND
PCB-1016	ND	ND	ND	ND	ND
PCB-1221	ND	ND	ND	ND	ND
PCB-1232	ND	ND	ND	ND	ND
PCB-1242	ND	ND	ND	ND	ND
PCB-1248	ND	ND	ND	ND	ND
PCB-1254	ND	ND	ND	ND	ND
PCB-1260	ND	ND	ND	ND	ND

NA - Not Analyzed

ND - Not Detected

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY SOIL

Job No: OR001
 Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830

QC Report No.: OCP-S-0031-88
 QC Sample No.: 88081967
 Level (Low/Med): Low
 Date Reported: 11-10-88

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
 88081966-88081977
 88081958-88081959

RWB

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2830	ND	101	107	46-127
Heptachlor	2830	ND	100	106	35-130
Aldrin	2830	ND	127	135*	34-132
Dieldrin	7070	ND	310	132	31-134
Endrin	7070	ND	288	122	42-139
4,4'-DDT	7070	ND	326	138*	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits	
					RPD	REC
Lindane	110	117	107	9	50	46-127
Heptachlor	109	116	106	9	31	35-130
Aldrin	149	158*	135*	16	43	34-132
Dieldrin	336	143*	132	8	38	31-134
Endrin	306	130	122	6	45	42-139
4,4'-DDT	347	147*	138*	6	50	23-134

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: 0 out of 6 outside limits

Spike Recovery: 5 out of 12 outside limits

**PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL**

Job No: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No.: OCP-S-0031-88B
QC Sample No.: Blank
Level (Low/Med): Low
Date Reported: 11-10-88

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88081966-88081977
88081958-88081959

[Signature]

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2000	ND	94.0	141*	46-127
Heptachlor	2000	ND	107	161*	35-130
Aldrin	2000	ND	162	243*	34-132
Dieldrin	5000	ND	314	188*	31-134
Endrin	5000	ND	267	160*	42-139
4,4'-DDT	5000	ND	266	160*	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits	
					RPD	REC
Lindane	98.0	147*	141*	4	50	46-127
Heptachlor	107	161*	161*	0	31	35-130
Aldrin	125	188*	243*	26	43	34-132
Dieldrin	317	190*	188*	10	38	31-134
Endrin	265	159*	160*	1	45	42-139
4,4'-DDT	293	176*	160*	10	50	23-134

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: 0 out of 6 outside limits

Spike Recovery: 12 out of 12 outside limits

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO.: OCP-S-0031-88
QC REPORT NO.: OCP-S-0031-88B

Analysis of matrix spikes resulted in recoveries of aldrin, dieldrin and DDT that were higher than EPA QC limits. Analysis of spiked blanks resulted in excessively high recoveries of all spiked compounds. The data associated with these analyses were closely examined. No analytical errors were found. The results suggest that the blanks were spiked twice.

Endrin aldehyde and Kepone were not recoverable because they were removed by the alumina column clean-up used on these samples.

PESTICIDE METHOD BLANK SUMMARY

Job No.: OR001 Lab Name: Engineering Science
 Client: ES Oak Ridge Lab Sample No.: Blank
 Attn: Bill Hayden Matrix: Soil
 Address: 710 S. Illinois Avenue Level (low/med): Low
 Suite F-103 Extraction:
 Oak Ridge, Tn. 37830 (SepF/Cont/Sonc): Sonc
 Date Reported: 11-11-88

Project: Duluth ANGB

Date Extracted: 8-27-88
 Date Analyzed (1): 9-26-88 Date Analyzed (2): 10-3-88
 Time Analyzed (1): 05:47 Time Analyzed (2): 21:50
 Instrument ID (1): 5890 #2 Instrument ID (2): 5890 #2
 GC Column ID (1): OV-1 GC Column ID (2): Mixed

This Method Blank applies to the following samples, MS and MSD.

EPA Sample No.	Lab Sample ID (1)	Date Analyzed 1	Lab Sample ID (2)	Date Analyzed 2
-	88081966	9-26-88	88081974	10-03-88
-	88081967	9-26-88	88081975	10-03-88
-	88081968	9-26-88	88081976	10-03-88
-	88081969	9-26-88		
-	88081970	9-26-88		
-	88081971	9-26-88		
-	88081972	9-26-88		
-	88081973	9-26-88		
-	88081974	9-26-88		
-	88081975	9-26-88		
-	88081976	9-26-88		
-	88081977	9-26-88		
-	88081958	9-26-88		
-	88081959	9-26-88		

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No.: OCP-S-0040-88
QC Sample No.: 88081938
Level (Low/Med): Low
Date Reported: 11-10-88

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88081938-88081957

[Signature]

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2380	ND	109	138*	46-127
Heptachlor	2380	ND	133	168*	35-130
Aldrin	2380	ND	103	130*	34-132
Dieldrin	5940	ND	321	162	31-134
Endrin	5940	ND	256	129	42-139
4,4'-DDT	5940	ND	1780	901*	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	RPD	REC
Lindane	66.6	84	138*	48	50	46-127
Heptachlor	70.0	88	168*	62*	31	35-130
Aldrin	70.4	89	130	38	43	34-132
Dieldrin	212	107	162*	41*	38	31-134
Endrin	188	95	129	31	45	42-139
4,4'-DDT	200	101	901*	160*	50	23-134

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: 3 out of 6 outside limits

Spike Recovery: 4 out of 12 outside limits

2893

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No.: OCP-S-0040-88B
QC Sample No.: Blank
Level (Low/Med): Low
Date Reported: 11-10-88

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s).:
88081938-88081957

MWBurton

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2000	ND	67.6	101	46-127
Heptachlor	2000	ND	83.7	126	35-130
Aldrin	2000	ND	80.0	120	34-132
Dieldrin	5000	ND	245	147*	31-134
Endrin	5000	ND	204	122	42-139
4,4'-DDT	5000	ND	219	131	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits	
					RPD	REC
Lindane	7.0	116	101	13	50	46-127
Heptachlor	87.9	132*	126	5	31	35-130
Aldrin	82.0	123	120	2	43	34-132
Dieldrin	264	158*	147*	7	38	31-134
Endrin	232	139	122	13	45	42-139
4,4'-DDT	252	151*	131	14	50	23-134

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: 0 out of 6 outside limits

Spike Recovery: 4 out of 12 outside limits

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO.: OCP-S-0040-88
QC REPORT NO.: OCP-S-0040-88B

Analysis of matrix spikes showed recoveries of lindane, heptachlor, dieldrin and DDT in the MS that were higher than EPA QC guidelines. RPDs were also above EPA QC guidelines for heptachlor, dieldrin and DDT. When spiked blanks were analyzed, the results showed recoveries of heptachlor, dieldrin and DDT that were higher than EPA recommended guidelines. The data associated with these analyses were closely examined. No analytical errors were found.

Endrin aldehyde and Kepone were not recoverable because they were removed by the alumina column clean-up used on these samples.

PESTICIDE METHOD BLANK SUMMARY

Job No.:	OR001	Lab Name:	Engineering Science
		Lab Sample No.:	Blank
Client:	ES Oak Ridge	Matrix:	Soil
Attn:	Bill Hayden	Level (low/med):	Low
Address:	710 S. Illinois Avenue	Extraction:	
	Suite F-103	(SepF/Cont/Sonc):	Sonc
	Oak Ridge, Tn. 37830	Date Reported:	11-11-88
Project:	Duluth ANGB		

Date Extracted:	8-26-88	Date Analyzed (2):	9-26-88
Date Analyzed (1):	9-22-88	Time Analyzed (2):	02:56
Time Analyzed (1):	15:44	Instrument ID (2):	5890 #2
Instrument ID (1):	5890 #2	GC Column ID (2):	Mixed
GC Column ID (1):	OV-1		

This Method Blank applies to the following samples, MS and MSD.

EPA Sample No.	Lab Sample ID (1)	Date Analyzed 1	Lab Sample ID (2)	Date Analyzed 2
-	88081938	9-23-88	88081944	9-26-88
-	88081943	9-23-88	88081949	9-26-88
-	88081944	9-23-88	88081957	9-26-88
-	88081945	9-23-88	88081952	9-26-88
-	88081946	9-23-88		
-	88081947	9-23-88		
-	88081948	9-23-88		
-	88081949	9-23-88		
-	88081950	9-23-88		
-	88081951	9-23-88		
-	88081952	9-23-88		
-	88081953	9-23-88		
-	88081954	9-24-88		
-	88081955	9-24-88		
-	88081956	9-24-88		
-	88081957	9-24-88		

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.:

OR001

Client:

ES Oak Ridge

Attn:

Bill Hayden

Address:

710 S. Illinois Avenue

Suite F-103

Oak Ridge, Tn. 37830

Project:

Duluth ANGB

QC Report for Laboratory Sample No(s):

88081943-88081953

88081966-88081970

QC Report No: VGC-S-0039-88

Sample Matrix: Soil

Conc. Unit: ug/KG

Date Received: 8-19-88

Date Prepared: NA

Date Analyzed: 8-31-88

Date Reported: 9-28-88

Dilution Factor: NA

% Moisture: 29.3

Laboratory Supervisor Approval:

[Signature]

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
88081967	Halocarbons: 8010									
	1,1-dichloroethane	14.1	ND	13.0	92	12.7	90	2	20	58-124
	Trichloroethene	14.1	ND	14.0	99	12.3	87	13	16	75-110
	Chlorobenzene	14.1	ND	13.0	92	12.4	88	5	21	71-125
88081967	Aromatics: 8020									
	Benzene	14.1	ND	10.9	77	10.6	75	3	26	75-123
	Toluene	14.1	ND	14.0	99	14.2	101	1	16	79-115
	Chlorobenzene	14.1	ND	12.7	90	12.7	90	0	24	82-112

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

$$\text{Relative Percent Difference (PR)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(\text{MS or MSD}) - \text{SR}}{\text{SA}} \times 100$$

MS = Spike Sample

MSD = Spike Sample Duplicate

SR = Sample Result

SA = Spike Added (Concentration)

NA = Not Applicable

NC = Not Calculated

ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: VGC-S-0037-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 8-18-88
Date Prepared: NA
Date Analyzed: 8-30-88
Date Reported: 9-26-88
Dilution Factor: NA
% Moisture: 15.8

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):

88081398-88081900, 88081904-88081906
88081938-88081942, 88081954-88081962

Laboratory Supervisor Approval:

[Signature]

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
88081938	Halocarbons: 8010									
	1,1-dichloroethane	11.9	ND	11.2	94	9.3	78	19	20	58-124
	Trichloroethene	11.9	ND	10.8	91	10.2	86	6	16	75-110
	Chlorobenzene	11.9	ND	11.2	94	11.4	96	2	21	71-125
88081938	Aromatics: 8020									
	Benzene	11.9	ND	10.2	86	9.9	83	3	26	75-123
	Toluene	11.9	2.1	11.6	80	11.6	80	0	16	79-115
	Chlorobenzene	11.9	ND	10.3	87	9.8	82	5	24	82-112

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

$$\text{Relative Percent Difference (PR)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(\text{MS or MSD}) - \text{SR}}{\text{SA}} \times 100$$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Residue
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Sample Matrix: Soil
Conc. Unit: ug/KG
Date Reported: 10-07-88

Laboratory Supervisor Approval:

[Signature]

Project: Duluth ANGB

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Un-known)	Conc	CRDL	Inclusive Sample Nos.
31	8-29-88	VGC	Carbopack	79-09-2 67-66-3	Dichloromethane Chloroform	2.5 0.5	0.25 0.05	88081954-88081959 88081938-88081940
6081/6058	8-30-88	VGC	Carbopack	75-09-2	Dichloromethane	3.8	0.25	88081948-88081949
57	8-30-88	VGC	Carbopack	75-09-2	Dichloromethane Trichloroethene	4.0 0.35	0.25 0.25	88081943-88081947 88081950-88081953 88081966-88081971
2899								

METHOD BLANK SUMMARY

Job No:

OR001

Client:

ES Oak Ridge
Bill Hayden

Attn:

710 S. Illinois Avenue
Suite F-103

Address:

Oak Ridge, Tn. 37830

Sample Matrix:

Soil

Conc. Unit:

ug/KG

Date Reported:

10-07-88

Laboratory Supervisor Approval:

[Signature]

Project:

Duluth ANGB

File ID	Date Analyzed	Fraction	Instru- ment ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
15	8-26-88	VGC	Carbopack	75-09-2 67-66-3	Dichloromethane Chloroform	3.3 0.2	5 0.05	88081898-88081900 88081904-88081906 88081960-88081962
31	8-29-88	VGC	Carbopack	75-09-2 67-66-3	Dichloromethane Chloroform	2.5 0.5	0.25 0.05	88081954-88081959 88081938-88081940
2900								

QUALITY CONTROL RESULTS SUMMARY METALS

Job No.: OR001
 Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830

QC Report No: CVM-S-0019-88
 Sample Matrix: Soil
 Conc. Unit: mg/KG
 Date Received: 8-18-88
 Date Reported: 10-25-88
 Dilution Factor: NA
 %Moisture: 28.7

Project: Duluth ANGB
 Laboratory Supervisor Approval:
[Signature]

QC Report for Laboratory Sample No(s):
 88081943-88081959
 88081956-88081968

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	C1	Duplicate C2	RPD	SA	Spike Recovery SR	SSR	PR	Notes
Mercury	88081944	88081944	9-13-88	9-13-88	7471	<0.1	<0.1	<0.1	NC	1.4	<0.1	1.5	107	

2901

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$
 C1 = Concentration One
 C2 = Concentration Two
 NA = Not Applicable
 NC = Not Calculated
 ND = Not Detected

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$
 SSR = Spiked Sample Result
 SR = Sample Result
 SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: ICP-S-0030-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-18-88
Date Reported: 10-25-88
Dilution Factor: NA
%Moisture: 16.9

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88081943-88081959
88081966-88081968

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	C1	Duplicate C2	RPD	SA	Spike Recovery SR	SSR	PR	Note:
Barium	88081943	88081943	9-16-88	9-11-88	SW6010	<20	56.4	52.2	8	21.4	56.4	277	103	
Cadmium	88081943	88081943	9-16-88	9-11-88	SW6010	<0.5	10.9	11.3	4	5.35	10.9	14.7	71N	
Chromium	88081943	88081943	9-16-88	9-11-88	SW6010	<1.0	19.2	21.7	12	21.4	19.2	42.6	109	

2902

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$
C1 = Concentration One
C2 = Concentration Two
NA = Not Applicable
NC = Not Calculated
ND = Not Detected

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$
SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

Job No.: OR001

Client: ES Oak Ridge

Attn: Bill Hayden

Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Laboratory Supervisor Approval:

Project: Duluth ANGB

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate		RPD	SA	Spike Recovery		PR	Notes
							C1	C2			SR	SSR		
Arsenic	88081945	88081945	10-05-88	9-21-88	7060	<0.5	<5.0E	<5.0E	NC	4.35E	0.98E	5.66	108	DF=10
Lead	88081945	88081945	10-10-88	9-21-88	7421	<0.5	8.22	8.90	8	5.63	8.22	14.86	118	DF=NA

2903

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
E See Legend attached.

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

$$\text{Relative Percent Difference (RPD)} = \frac{C1 - C2}{(C1 + C2)/2} \times 100$$
$$\text{Percent Recovery (PR)} = \frac{\text{SSR} - \text{SR} \times 100}{\text{SA}}$$

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
Samples No.: 88C81943-88081959

The results obtained for the laboratory control sample (LCS) analyzed with these samples for the analytes Cadmium, Chromium, Mercury and Barium exceeded the recommended EPA recoveries. All data associated with this batch was closely inspected and no analytical problems were found. The initial and continuing calibration verification standards and blanks and precision and accuracy recoveries were within acceptable limits with the following exceptions:

Cadmium spike recoveries and precision exceeded acceptable limits. The spike sample was followed by an analytical spike as required by laboratory standard operating procedure. The results of the analytical spike recovery for Cadmium were within acceptable ranges.

As a result of extreme sample matrix interference, dilution was required for sample analysis. The reporting limit and MDL for the analyte(s) listed have increased as shown.

<u>Analyte</u>	<u>Reporting Limit</u>	<u>MDL</u>
Arsenic	10 mg/Kg	5.0 mg/Kg

ATILE ORGANICS INITIAL CALIBRATION DATA

Name: _____ Contract: _____

Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID.: carbopak Calibration Date(s): 8/30/88 8/15/88

LAB FILE ID: _____ RRF10= 52,40 RRF20= 53,41
RF 50= 54,42 RRF100= 55,43 RRF200= 56,44

COMPOUND	RRF10	RRF20	RRF50	RRF100	RRF200	RRF	%RSD
benzyl chloride	0.08	0.04	0.09	0.10	0.08	0.08	29.24
is (2-chloroethoxy)							
methane	0.03	0.03	0.05	0.04	0.06	0.04	31.04
is (2-chloroisopropyl)							
ether	0.24	0.27	0.26	0.24	0.30	0.26	9.50
monobenzene	1.00	1.26	1.31	1.23	1.26	1.21	10.06
monodichloromethane	2.36	2.78	3.04	3.41	3.39	2.99	14.80
monomorph	0.37	0.91	0.75	0.83	1.09	0.79	33.74
monomethane	0.26	0.19	0.26	0.21	0.24	0.23	13.40
carbon tetrachloride	2.43	2.92	3.20	3.24	3.08	2.98	11.02
chloroacetaldehyde	0.001	0.002	0.001	0.005	0.003	ERR	ERR 69
chlorobenzene	1.22	1.43	1.43	1.41	1.45	1.39	6.95
chloroethane	0.59	0.32	0.42	0.37	0.30	0.40	28.48
chloroform	2.71	3.77	3.82	4.17	3.72	3.64	15.08
-Chlorohexane	0.83	0.88	0.95	0.91	1.02	0.92	7.83
-Chloroethyl vinyl ether	0.03	0.03	0.05	0.04	0.06	0.04	31.04
chloromethane	0.31	0.23	0.24	0.20	0.17	0.23	23.10
chloromethyl methyl ether	0.12	0.21	0.22	0.16	0.15	0.17	24.46
m, & p Chlorotoluenes	4.21	4.22	3.93	3.70	3.90	3.99	5.56
bromochloromethane	3.44	3.42	3.46	3.81	3.82	3.59	5.74
ibromomethane	2.98	3.04	3.29	3.04	2.56	2.98	8.87
2_Dichlorobenzene	2.45	2.54	2.44	2.34	2.04	2.36	8.16
3_Dichlorobenzene	2.22	2.11	2.06	2.32	8.21	3.38	79.78
,4_Dichlorobenzene	2.67	2.59	2.49	2.60	2.20	2.51	7.28
ichlorodifluormethane	0.51	0.49	0.50	0.57	0.64	0.54	11.63
1_Dichloroethane	0.75	1.16	1.65	1.86	1.75	1.43	32.62
2_Dichloroethane	0.96	1.61	1.77	2.04	2.09	1.69	26.83
,1_Dichloroethylene	0.80	0.96	1.44	1.37	1.73	1.26	29.78
ans_1,2_dichloroethylene	0.90	1.34	1.55	1.73	1.57	1.42	22.57
chloromethane	6.60	4.34	3.79	3.14	2.66	4.11	37.30
,2_Dichloropropane	1.96	2.21	2.58	1.82	1.08	1.93	28.82
3_Dichloropropylene	4.60	4.56	4.69	4.50	4.66	4.60	1.66
1,2,2_Tetrachloroethane	7.74	7.12	6.75	6.75	6.10	6.89	8.67
,1,1,2_Tetrachloroethane	3.89	3.60	3.41	3.20	3.94	3.61	8.71
etrachloroethylene	7.74	7.12	6.75	6.75	6.10	6.89	8.70
1,1,1-Trichloroethane	1.35	1.65	1.79	2.03	1.92	1.75	14.93
1,2-Trichloroethane	4.60	4.56	4.69	4.50	4.66	4.60	1.66
richloroethylene	4.73	4.74	4.40	3.92	3.29	4.22	14.67
richlorodifluoromethane	2.71	1.35	1.46	1.72	1.54	1.76	31.28
richloropropane	4.47	3.74	3.60	3.29	2.83	3.59	16.87
ipyl chloride	0.13	0.60	0.59	0.47	0.51	0.46	47.33

STILE ORGANICS INITIAL CALIBRATION DATA

Name:ENGINEERING SCIENCE_____ Contract:_____

Code:_____ Case No.:_____ SAS No.:_____ SDG No.:_____

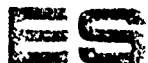
Instrument ID.:carbopak Calibration Date(s):8/30/88 _____

RF 50=_____54_____ RRF100=_____55_____ RRF200=_____56_____

1POUND	RRF10	RRF20	RRF50	RRF100	RRF200	RRF	%RSD
Benzene	8.68	4.56	3.53	2.47	2.13	4.27	61.84
Chlorobenzene	5.26	3.09	5.85	3.85	2.88	4.19	31.52
1,2-Dichlorobenzene	2.47	2.01	2.32	2.37	2.03	2.24	9.36
1,3-Dichlorobenzene	2.78	2.71	2.57	2.98	2.62	2.73	5.97
1,4-Dichlorobenzene	3.71	3.82	2.44	3.00	2.46	3.09	21.36
Nitro Benzene	3.42	1.86	3.34	2.27	1.82	2.54	30.89
Toluene	4.21	2.63	4.08	3.02	2.16	3.22	27.98
Xylenes	9.71	7.19	9.77	7.36	6.24	8.05	19.83

DATA PACKAGE #55

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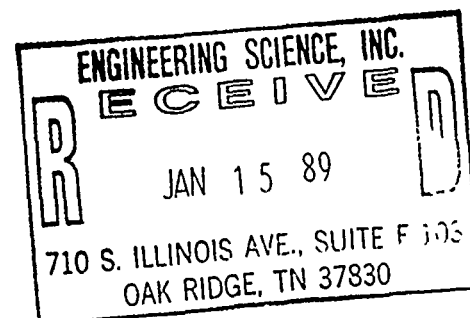


ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830



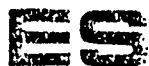
Project: Duluth ANGB

Attached are the analytical reports for the soil samples received
by this laboratory on 8-26-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* ex.racted	Date analyzed	Date* 2nd col.
88082130	DANGB-3-MW35-SS3A	AS-F	8-25-88		10-10-88	
88082130	DANGB-3-MW35-SS3A	BA-I	8-25-88		9-19-88	
88082130	DANGB-3-MW35-SS3A	CD-F	8-25-88		9-19-88	
88082130	DANGB-3-MW35-SS3A	CR-F	8-25-88		9-19-88	
88082130	DANGB-3-MW35-SS3A	HG-C	8-25-88		9-21-88	
88082130	DANGB-3-MW35-SS3A	PB-F	8-25-88		10-20-88	
88082130	DANGB-3-MW35-SS3A	418.1	8-25-88	9-19-88	9-20-88	
88082130	DANGB-3-MW35-SS3A	MOIS	8-25-88		9-02-88	
88082130	DANGB-3-MW35-SS3A	8010	8-25-88		9-03-88	9-02-88
88082130	DANGB-3-MW35-SS3A	8020	8-25-88		9-03-88	9-06-88
88082130	DANGB-3-MW35-SS3A	8080	8-25-88	9-01-88	9-27-88	
88082130	DANGB-3-MW35-SS3A	8270	8-25-88	9-02-88	10-13-88	

* If applicable

**ENGINEERING-SCIENCE, INC.**600 BANCROFT WAY
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(415) 548-7970

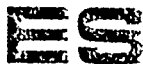
Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88082131	DANGB-3-MW35-SS2	AS-F	8-25-88		10-07-88	
88082131	DANGB-3-MW35-SS2	BA-I	8-25-88		9-19-88	
88082131	DANGB-3-MW35-SS2	CD-F	8-25-88		9-19-88	
88082131	DANGB-3-MW35-SS2	CR-F	8-25-88		9-19-88	
88082131	DANGB-3-MW35-SS2	HG-C	8-25-88		9-21-88	
88082131	DANGB-3-MW35-SS2	PB-F	8-25-88		10-04-88	
88082131	DANGB-3-MW35-SS2	418.1	8-25-88	9-19-88	9-20-88	
88082131	DANGB-3-MW35-SS2	MOIS	8-25-88		9-02-88	
88082131	DANGB-3-MW35-SS2	8010	8-25-88		9-03-88	9-02-88
88082131	DANGB-3-MW25-SS2	8020	8-25-88		9-03-88	9-06-88
88082131	DANGB-3-MW35-SS2	8080	8-25-88	9-01-88	9-27-88	
88082131	DANGB-3-MW35-SS2	8270	8-25-88	9-02-88	10-13-88	
88082132	DANGB-3-MW35-SS1	AS-F	8-25-88		10-07-88	
88082132	DANGB-3-MW35-SS1	BA-I	8-25-88		9-19-88	
88082132	DANGB-3-MW35-SS1	CD-F	8-25-88		9-19-88	
88082132	DANGB-3-MW35-SS1	CR-F	8-25-88		9-19-88	
88082132	DANGB-3-MW35-SS1	HG-C	8-25-88		9-21-88	
88082132	DANGB-3-MW35-SS1	PB-F	8-25-88		10-04-88	
88082132	DANGB-3-MW35-SS1	418.1	8-25-88	9-19-88	9-20-88	
88082132	DANGB-3-MW35-SS1	MOIS	8-25-88		9-02-88	
88082132	DANGB-3-MW35-SS1	8010	8-25-88		9-03-88	9-03-88
88082132	DANGB-3-MW35-SS1	8020	8-25-88		9-03-88	9-06-88
88082132	DANGB-3-MW35-SS1	8080	8-25-88	9-01-88	9-27-88	
88082132	DANGB-3-MW35-SS1	8270	8-25-88	9-02-88	10-13-88	

* If applicable



ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88082133	DANGB-3-MW35-SS3	AS-F	8-25-88		10-07-88	
88082133	DANGB-3-MW35-SS3	BA-I	8-25-88		9-19-88	
88082133	DANGB-3-MW35-SS3	CD-F	8-25-88		9-19-88	
88082133	DANGB-3-MW35-SS3	CR-F	8-25-88		9-19-88	
88082133	DANGB-3-MW35-SS3	HG-C	8-25-88		9-21-88	
88082133	DANGB-3-MW35-SS3	PB-F	8-25-88		10-04-88	
88082133	DANGB-3-MW35-SS3	418.1	8-25-88	9-19-88	9-20-88	
88082133	DANGB-3-MW35-SS3	MOIS	8-25-88		9-02-88	
88082133	DANGB-3-MW35-SS3	8010	8-25-88		9-03-88	9-03-88
88082133	DANGB-3-MW35-SS3	8020	8-25-88		9-03-88	9-06-88
88082133	DANGB-3-MW35-SS3	8080	8-25-88	9-01-88	9-27-88	
88082133	DANGB-3-MW35-SS3	8270	8-25-88	9-02-88	10-13-88	

* If applicable

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88082130-88082133
WORK ORDER NO.: 918

These soil samples were received at the ES Berkeley Laboratory on 8-26-88. They were received cold and intact.

The 8270 analysis for these soil samples exceeded the method holding time by one day.

Due to a suspected interelement matrix interference, all cadmium data at levels reportable by ICP analysis (≥ 1 mg/KG dry wt.) are potentially false positives. This is being investigated and follow-up will be provided when available.

ANALYSIS REPORT

WORK ORDER NUMBER: 918
JOB NUMBER : Z80000000440
WORK ORDER DATE : 08/26/88

APPROVED BY


Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 2, UNITS: mg/Kg

TEST COMPOUND	DANGB-3-MW35- SS3A 88082130	DANGB-3-MW35- SS2 88082131	DANGB-3-MW35- SS1 88082132	DANGB-3-MW35- SS3 88082133
	-----	-----	-----	-----
ACID DIG SOIL	NA	NA	NA	NA
ARSENIC	<5.0E	<5.0WE	<5.0E	<5.0E
BARIUM	40.4	50.1	54.8	43.7
CADMIUM	10.9N E	9.7N E	14.3NE	10.7NE
CHROMIUM	26.5	35.4	43.7	27.3
MERCURY	<0.1	<0.1	<0.1	<0.1
LEAD	6.0N	5.0*	22.5S*	2.8*

ND - Not Detected

NA - Not Applicable

ANALYSIS REPORT

ORK ORDER NUMBER: 918
B NUMBER : Z80000000440
RK ORDER DATE : 08/26/88

APPROVED BY


Lab Supervisor

PORT DATA:
OAK RIDGE/DULUTH ANGB
O S. ILLINOIS AVE. STE. S103
K RIDGE, TN 37830
LL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

ONTRACT / PO # : OR001
ONTACT : BILL HAYDEN
(615)-481-3920

SK: 3, UNITS: mg/Kg

	DANGB-3-MW35- SS3A	DANGB-3-MW35- SS2	DANGB-3-MW35- SS1	DANGB-3-MW35- SS3
ST COMPOUND	88082130	88082131	88082132	88082133

8.1 PETROLEUM HYDROCARBONS	<100	<100	130	600
MOISTURE	8.4	10.4	7.5	7.8

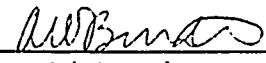
- Not Detected

12/29/88

ANALYSIS REPORT

WORK ORDER NUMBER: 918
 JOB NUMBER : Z80000000440
 WORK ORDER DATE : 08/26/88

APPROVED BY


 Lab Supervisor

REPORT DATA:

ES OAK RIDGE/DULUTH ANGB
 710 S. ILLINOIS AVE. STE. S103
 OAK RIDGE, TN 37830
 BILL HAYDEN

CLIENT DATA:

ES OAK RIDGE/DULUTH ANGB (134)
 710 S. ILLINOIS AVE. STE. S103
 OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
 CONTACT : BILL HAYDEN
 (615)-481-3920

TASK: 4, UNITS: ug/KG, GROUP 8010

TEST COMPOUND	DANGB-3-MW35- SS3A 88082130	DANGB-3-MW35- SS2 88082131	DANGB-3-MW35- SS1 88082132	DANGB-3-MW35- SS3 88082133
BENZYL CHLORIDE	ND	ND	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND	ND	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND	ND	ND	ND
BROMOBENZENE	ND	ND	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND	ND
BROMOFORM	ND	ND	ND	ND
BROMOETHANE	ND	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND	ND
CHLORACETALDEHYDE	ND	ND	ND	ND
CHLORAL	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND
CHLOROETHANE	ND	ND	ND	ND
CHLOROFORM	0.118	ND	ND	0.098
1-CHLOROHEXANE	ND	ND	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND	ND	ND
CHLOROMETHANE	ND	ND	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND	ND	ND
CHLOROTOLUENE	ND	ND	ND	ND
DIBROMOCHLOROMETHANE	ND	ND	ND	ND
DIBROMOMETHANE	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND	0.25
1,2-DICHLOROETHANE	ND	ND	ND	ND
1,1-DICHLOROETHYLENE	ND	ND	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND	ND	ND
DICHLOROMETHANE	5.28	8.18	9.28	8.68
1,2-DICHLOROPROPANE	ND	ND	ND	ND

ND - Not Detected

	DANGB-3-MW35-SS3A	DANGB-3-MW35-SS2	DANGB-3-MW35-SS1	DANGB-3-MW35-SS3
TEST COMPOUND	88082130	88082131	88082132	88082133
3-DICHLOROPROPYLENE	ND	ND	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND	ND	ND
1,1,2-TETRACHLOROETHANE	ND	ND	ND	ND
TETRACHLOROETHYLENE	ND	ND	ND	ND
1,1-TRICHLOROETHANE	ND	ND	ND	ND
1,2-TRICHLOROETHANE	ND	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND	ND
TRICHLOROFLUOROMETHANE	ND	ND	ND	ND
TRICHLOROPROPANE	ND	ND	ND	ND
POLYNYL CHLORIDE	ND	ND	ND	ND

) - Not Detected

11/29/88

ANALYSIS REPORT

WORK ORDER NUMBER: 918
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/26/88

APPROVED BY


Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/KG, GROUP 8020

TEST COMPOUND	DANGB-3-MW35- SS3A 88082130	DANGB-3-MW35- SS2 88082131	DANGB-3-MW35- SS1 88082132	DANGB-3-MW35- SS3 88082133
BENZENE	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND
ETHYL BENZENE	ND	ND	ND	ND
TOLUENE	2.0	13	18	7.9
XYLENES	ND	ND	ND	ND

ND - Not Detected

11/29/88

ANALYSIS REPORT

WORK ORDER NUMBER: 918
 WORK NUMBER : ZB0000000440
 WORK ORDER DATE : 08/26/88

APPROVED BY

Lab Supervisor

PORT DATA:

OAK RIDGE/DULUTH ANGB
 60 S. ILLINOIS AVE. STE. S103
 OAK RIDGE, TN 37830
 BILL HAYDEN

CLIENT DATA:

ES OAK RIDGE/DULUTH ANGB (134)
 710 S. ILLINOIS AVE. STE. S103
 OAK RIDGE, TN 37830

OF REPORT COPIES: 1

INTRACT / PO # : OR001
 INTRACT : BILL HAYDEN
 (615)-481-3920

SK: 4, UNITS: ug/Kg, GROUP 8080

ST COMPOUND	DANGB-3-MW35- SS3A	DANGB-3-MW35- SS2	DANGB-3-MW35- SS1	DANGB-3-MW35- SS3
	88082130	88082131	88082132	88082133
DRIN	ND	ND	ND	ND
PHA-BHC	ND	ND	ND	ND
TA-BHC	ND	ND	ND	ND
LTA-BHC	ND	ND	ND	ND
MMA-BHC	ND	ND	ND	ND
LORDANE	ND	ND	ND	ND
4'-DDD	ND	ND	ND	ND
4'-DDE	ND	ND	ND	ND
4'-DDT	ND	ND	ND	ND
ELDRIN	ND	ND	ND	ND
DOSULFAN I	ND	ND	ND	ND
DOSULFAN II	ND	ND	ND	ND
DOSULFAN SULFATE	ND	ND	ND	ND
DRIN	ND	ND	ND	ND
DRIN ALDEHYDE	NA	NA	NA	NA
PTACHLOR	ND	ND	ND	ND
PTACHLOR EPOXIDE	ND	ND	ND	ND
PONE	NA	NA	NA	NA
THOXYCHLOR	ND	ND	ND	ND
XAPHENE	ND	ND	ND	ND
B-1016	ND	ND	ND	ND
B-1221	ND	ND	ND	ND
B-1232	ND	ND	ND	ND
B-1242	ND	ND	ND	ND
B-1248	ND	ND	ND	ND
B-1254	ND	ND	ND	ND
B-1260	ND	ND	ND	ND

- Not Detected

A - Not Analyzed

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

page 1 of 5

Date Received: August 26, 1988
Date Reported: December 6, 1988

Work Order: 918
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082130	88082131
Sample No.:	DANGB-3-MW35-SS3A	DANGB-3-MW35-SS2
Date Sampled:	8-25-88	8-25-88
Time Sampled:	10:15	08:53
Date Extracted:	9-02-88	9-02-88
Date Analyzed:	11-30-88	10-13-88
Percent Moisture:	8	10

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg	
1,3-Dichlorobenzene	330	ND	ND
1,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Bis(2-chloroethyl)ether	330	ND	ND
1,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Bis(2-chloroisopropyl)ether	330	ND	ND
N-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
Nitrobenzene	330	ND	ND
Isophorone	330	ND	ND
Naphthalene	330	ND	ND
Bis(2-chloroethoxy)methane	330	ND	ND
2-Chloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
Acenaphthylene	330	ND	ND
Acenaphthene	330	ND	ND
Dimethyl phthalate	330	ND	ND
2,6-Dinitrotoluene	330	ND	ND
Fluorene	330	ND	ND
2,4-Dinitrotoluene	330	ND	ND
Diethyl phthalate	330	ND	ND
N-Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

B = Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

page 2 of 5

Date Received: August 26, 1988
Date Reported: December 6, 1988

Work Order: 918
Job Number: OR001

DR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082130	88082131
Sample No.:	DANGB-3-MW35-SS3A	DANGB-3-MW35-SS2
Date Sampled:	8-25-88	8-25-88
Time Sampled:	10:15	08:53
Date Extracted:	9-02-88	9-02-88
Date Analyzed:	11-30-88	10-13-88
Percent Moisture:	8	10

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Benanthrene	330	ND	ND
Anthracene	330	ND	ND
n-Butyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
2-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
n-Butyl Benzyl phthalate	330	ND	ND
Di(2-ethylhexyl) phthalate	330	ND	ND
Triphenylene	330	ND	ND
2-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
1-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benzenzidine	2000	ND	ND
2,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Benzo(1,2,3-cd)pyrene	330	ND	ND
Benzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzy Alcohol	660	ND	ND

= Compound was detected in the blank.

Base Neutrals - SW 8270

Matrix: Soil

(continued)

Date Received: August 26, 1988

Work Order: 918

Date Reported: December 6, 1988

Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB

ATTN: Mr. Bill Hayden

Address: 710 S. Illinois Avenue Suite F-103

Oak Ridge, Tennessee 37830

Lab Number:	88082130	88082131
Sample No.:	DANGB-3-MW35-SS3A	DANGB-3-MW35-SS2
Date Sampled:	8-25-88	8-25-88
Time Sampled:	10:15	08:53
Date Extracted:	9-02-88	9-02-88
Date Analyzed:	11-30-88	10-13-88
Percent Moisture:	8	10

Compound	Detection Limits	Analytical Results	
	ug/kg	ug/kg	ug/kg
Acetophenone	--*	ND	ND
Aniline	--*	ND	ND
4-Aminobiphenyl	--*	ND	ND
4-Chloroaniline	660	ND	ND
4-Chloronaphthalene	--*	ND	ND
Dibenzofuran	330	ND	ND
N,N-Dimethylaminoazobenzene	--*	ND	ND
7,12-Dimethylbenz(a)anthracene	--*	ND	ND
N,N'-Dimethylphenethylamine	--*	ND	ND
Diphenylamine	--*	ND	ND
4,4'-Diphenylhydrazine	--*	ND	ND
Methyl methanesulfonate	--*	ND	ND
3-Methylcholanthrene	--*	ND	ND
Methyl methanesulfonate	--*	ND	ND
1-Methylnaphthalene	330	ND	ND
1-Naphthylamine	--*	ND	ND
2-Naphthylamine	--*	ND	ND
2-Nitroaniline	1600	ND	ND
3-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
N-Nitroso-di-n-butylamine	--*	ND	ND
N-Nitrosopiperidine	--*	ND	ND
Pentachlorobenzene	--*	ND	ND
Pentachloronitrobenzene	--*	ND	ND
Phenacetin	--*	ND	ND
2-Picoline	--*	ND	ND
Pronamide	--*	ND	ND
1,2,4,5-Tetrachlorobenzene	--*	ND	ND

EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

page 4 of 5

Date Received: August 26, 1988
Date Reported: December 6, 1988

Work Order: 918
Job Number: OR001

DR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082130	88082131
Sample No.:	DANGB-3-MW35-SS3A	DANGB-3-MW35-SS2
Date Sampled:	8-25-88	8-25-88
Time Sampled:	10:15	08:53
Date Extracted:	9-02-88	9-02-88
Date Analyzed:	11-30-88	10-13-88
Percent Moisture:	8	10

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Alpha-BHC	--*	ND	ND
Gamma-BHC	--*	ND	ND
Beta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Dieldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
Dieldrin	500	ND	ND
1,4'-DDE	1000	ND	ND
Dieldrin	--*	ND	ND
Endosulfan II	--*	ND	ND
1,4'-DDD	500	ND	ND
1,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Dieldrin aldehyde	--*	ND	ND
Dieldrin Ketone	--*	ND	ND
Alordane	2000	ND	ND
Heptoxychlor	--*	ND	ND
Dioxaphene	2000	ND	ND
roclor-1016	2000	ND	ND
roclor-1221	2000	ND	ND
roclor-1232	2000	ND	ND
roclor-1242	2000	ND	ND
roclor-1248	2000	ND	ND
roclor-1254	2000	ND	ND
roclor-1260	2000	ND	ND

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

page 5 of 5

Date Received: August 26, 1988
Date Reported: December 6, 1988

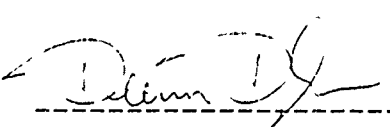
Work Order: 918
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

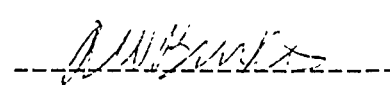
ATTN: Mr. Bill Hayden

Lab Number:	88082130	88082131
Sample No.:	DANGB-3-MW35-SS3A	DANGB-3-MW35-SS2
Date Sampled:	8-25-88	8-25-88
Time Sampled:	10:15	08:53
Date Extracted:	9-02-88	9-02-88
Date Analyzed:	11-30-88	10-13-88
Percent Moisture:	8	10

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
2-Chlorophenol	330	ND	ND
2-Nitrophenol	330	ND	ND
Phenol	330	ND	ND
2,4-Dimethylphenol	330	ND	ND
2,4-Dichlorophenol	330	ND	ND
2,4,6-Trichlorophenol	330	ND	ND
2-Chloro-3-methylphenol	660	ND	ND
2,4-Dinitrophenol	1600	ND	ND
2,6-Dichlorophenol	--*	ND	ND
2-Methyl-4,6-Dinitrophenol	1600	ND	ND
Pentachlorophenol	1600	ND	ND
4-Nitrophenol	1600	ND	ND
Benzoic Acid	1600	ND	ND
2-Methylphenol	330	ND	ND
3- & 4-Methylphenol	330	ND	ND
2,3,4,6-Tetrachlorophenol	--*	ND	ND
2,4,5-Trichlorophenol	330	ND	ND



Analyst



Laboratory Supervisor

EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

page 1 of 5

Work Order: 918
Job Number: OR001

ATTN: Mr. Bill Hayden

Compound	Detection Limits	ANALYTICAL RESULTS (dry weight)	
	ug/kg	ug/kg	ug/kg
,3-Dichlorobenzene	330	ND	ND
,4-Dichlorobenzene	330	ND	ND
exachloroethane	330	ND	ND
is(2-chloroethyl)ether	330	ND	ND
,2-Dichlorobenzene	330	ND	ND
-Nitrosodimethylamine	330	ND	ND
is(2-chloroisopropyl)ether	330	ND	ND
-Nitrosodi-n-propylamine	330	ND	ND
exachlorobutadiene	330	ND	ND
,2,4-Trichlorobenzene	330	ND	ND
trobenzene	330	ND	ND
sophorone	330	ND	ND
aphthalene	330	ND	ND
is(2-chloroethoxy)methane	330	ND	ND
-Chloronaphthalene	330	ND	ND
exachlorocyclopentadiene	330	ND	ND
cenaphthylene	330	ND	ND
cenaphthene	330	ND	ND
imethyl phthalate	330	ND	ND
,6-Dinitrotoluene	330	ND	ND
luorene	330	ND	ND
,4-Dinitrotoluene	330	ND	ND
iethyl phthalate	330	ND	ND
-Nitrosodiphenylamine	330	ND	ND
exachlorobenzene	330	ND	ND

2924

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

page 2 of 5

Date Received: August 26, 1988
Date Reported: December 6, 1988

Work Order: 918
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082132	88082133
Sample No.:	DANGB-3-MW35-SS1	DANGB-3-MW35-SS3
Date Sampled:	8-25-88	8-25-88
Time Sampled:	10:15	08:53
Date Extracted:	9-02-88	9-02-88
Date Analyzed:	10-27-88	11-30-88
Percent Moisture:	8	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Dibutyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
1-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Butyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
4-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benzidine	2000	ND	ND
3,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

ND = Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Page 3 of 5

Date Received: August 26, 1988
Date Reported: December 6, 1988

Work Order: 918
Job Number: OR001

From: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082132	88082133
Sample No.:	DANGB-3-MW35-SS1	DANGB-3-MW35-SS3
Date Sampled:	8-25-88	8-25-88
Time Sampled:	10:15	08:53
Date Extracted:	9-02-88	9-02-88
Date Analyzed:	10-27-88	11-30-88
Percent Moisture:	8	8

Compound	Detection Limits ug/kg	Analytical Results (dry weight)	
		ug/kg	ug/kg
Acetophenone	--*	ND	ND
Aniline	--*	ND	ND
-Aminobiphenyl	--*	ND	ND
-Chloroaniline	660	ND	ND
-Chloronaphthalene	--*	ND	ND
Indenzofuran	330	ND	ND
-Dimethylaminoazobenzene	--*	ND	ND
,12-Dimethylbenz(a)anthracene	--*	ND	ND
-,a-Dimethylphenethylamine	--*	ND	ND
iphenylamine	--*	ND	ND
,2-Diphenylhydrazine	--*	ND	ND
thyl methanesulfonate	--*	ND	ND
-Methylcholanthrene	--*	ND	ND
ethyl methanesulfonate	--*	ND	ND
-Methylnaphthalene	330	ND	ND
-Naphthylamine	--*	ND	ND
-Naphthylamine	--*	ND	ND
-Nitroaniline	1600	ND	ND
-Nitroaniline	1600	ND	ND
-Nitroaniline	1600	ND	ND
-Nitroso-di-n-butylamine	--*	ND	ND
-Nitrosopiperidine	--*	ND	ND
entachlorobenzene	--*	ND	ND
entachloronitrobenzene	--*	ND	ND
enacetin	--*	ND	ND
-Picoline	--*	ND	ND
onamide	--*	ND	ND
,2,4,5-Tetrachlorobenzene	--*	ND	ND

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

page 4 of 5

Date Received: August 26, 1988
Date Reported: December 6, 1988

Work Order: 918
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082132	88082133
Sample No.:	DANGB-3-MW35-SS1	DANGB-3-MW35-SS3
Date Sampled:	8-25-88	8-25-88
Time Sampled:	10:15	08:53
Date Extracted:	9-02-88	9-02-88
Date Analyzed:	10-27-88	11-30-88
Percent Moisture:	8	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Alpha-BHC	--*	ND	ND
Gamma-BHC	--*	ND	ND
Beta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Aldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
Dieldrin	500	ND	ND
4,4'-DDE	1000	ND	ND
Endrin	--*	ND	ND
Endosulfan II	--*	ND	ND
4,4'-DDD	500	ND	ND
4,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	--*	ND	ND
Endrin Ketone	--*	ND	ND
Chlordane	2000	ND	ND
Methoxychlor	--*	ND	ND
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1248	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

page 5 of 5

Date Received: August 26, 1988
Date Reported: December 6, 1988

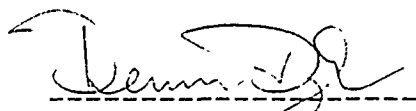
Work Order: 918
Job Number: OR001

Location: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Avenue Suite F-103
Oak Ridge, Tennessee 37830

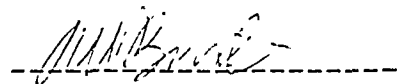
ATTN: Mr. Bill Hayden

Job Number:	88082132	88082133
Sample No.:	DANGB-3-MW35-SS1	DANGB-3-MW35-SS3
Date Sampled:	8-25-88	8-25-88
Time Sampled:	10:15	08:53
Date Extracted:	9-02-88	9-02-88
Date Analyzed:	10-27-88	11-30-88
Percent Moisture:	8	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
-Chlorophenol	330	ND	ND
-Nitrophenol	330	ND	ND
phenol	330	ND	ND
,4-Dimethylphenol	330	ND	ND
,4-Dichlorophenol	330	ND	ND
,4,6-Trichlorophenol	330	ND	ND
-Chloro-3-methylphenol	660	ND	ND
,4-Dinitrophenol	1600	ND	ND
,6-Dichlorophenol	--*	ND	ND
-Methyl-4,6-Dinitrophenol	1600	ND	ND
pentachlorophenol	1600	ND	ND
-Nitrophenol	1600	ND	ND
benzoic Acid	1600	ND	ND
-Methylphenol	330	ND	ND
- & 4-Methylphenol	330	ND	ND
,3,4,6-Tetrachlorophenol	--*	ND	ND
,4,5-Trichlorophenol	330	ND	ND



Analyst



Laboratory Supervisor

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

CHAIN OF CUSTODY RECORD 9/18

ES JOB NO. OR001	PROJECT NAME/LOCATION Duluth ANGB/Duluth, Mn.		NO. OF CON-TAINERS	SOILS ANALYSES REQUIRED										SHIP TO: ENGINEERING-SCIENCE LABORATORY, INC. 600 Bancroft Way Berkeley, CA. 94710	
	DATE	TIME		SAMPLE DESCRIPTION	SW8010, 8020	SW8080	SW8270	EPA 418.1	SW6010, 7181	SW7131, 7421	SW7060	SW4471			
SAMPLER(S): (Signature) <i>Mike Roddy</i>															
8/25/88	10:15	DANGB-3-MW35-SS3A	1	X	X	X	X	X	X	X	X	X	882130		
8/25/88	8:53	DANGB-3-MW35-SS2	1	X	X	X	X	X	X	X	X	X	882131		
8/25/88	8:52	DANGB-3-MW35-SS1	1	X	X	X	X	X	X	X	X	X	882132		
8/25/88	10:25	DANGB-3-MW35-SS3	1	X	X	X	X	X	X	X	X	X	882133		
8/25/88	10:25	DANGB-3-MW35-SS3	1	X											
8/26/88	10:15	DANGB-3-MW35-SS3A	1	X									882130		
8/25/88	8:53	DANGB-3-MW35-SS2	1	X									882131		
8/25/88	8:50	DANGB-3-MW35-SS1	1	X									882132		
2029															
Relinquished by: (Signature) <i>Jo Ann Shewin</i>			Received by: (Signature)	Date/Time 8/25/88 5:30p	Relinquished by: (Signature)				Date/Time	Received by: (Signature)				Date/Time	Remarks Rec'd call & contact
Relinquished by: (Signature)			Received for Laboratory by: (Signature) <i>Bill Swedman</i>	Date/Time	Relinquished by: (Signature)				Date/Time 8-26-88 12:10	Received by: (Signature)				Date/Time	Remarks

QC Report No:	ICP-S-0028-88
Sample Matrix:	Soil
Conc. Unit:	mg/KG
Date Received:	8-26-88
Date Reported:	10-13-88
Dilution Factor:	NA
%Moisture:	7.8

Job No.:	ORCJ1
Client:	ES Oak Ridge
Attn:	Bill Hayden
Address:	710 S. Illinois Avenue Suite F-103 Oak Ridge, Tn. 37830

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Cl	Duplicate C2	RPD	SA	Spike Recovery SR	SSR	PR	Notes
Barium	88082133	88082133	9-10-88	9-15-88	6010	<20	43.7	43.9	<1	217	43.7	275	107	
Cadmium	88082133	88082133	9-10-88	9-15-88	6010	<0.5	10.7	10.7	0	5.42	10.7	13.9	59N	A
Chromium	88082133	88082133	9-10-88	9-15-88	6010	<1.0	27.3	30.4	11	21.7	27.3	50.3	106	

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

See Legend attached.

A See Case Narrative attached.

$$\text{Relative Percent Difference (RPD)} = \frac{C1 - C2}{(C1 + C2)/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{\text{SR} - \text{SR} \times 100}{\text{SA}}$$

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY

SAMPLE NO(S).: 88081969-88081976, 88082043-88082049

SAMPLE NO(S).: 88082099-88082101, 88082102-88082104

SAMPLE NO(S).: 88082130-88082133, 88082146-88082148

QC REPORT NO.: ICP-S-0028-88

QC REPORT NO.: ICP-S-0031-88

Due to a suspected interelement matrix interference, all cadmium data at levels reportable by ICP analysis (>1 mg/KG dry weight) are potentially false positives. This is being investigated and follow-up will be provided when available.

QUALITY CONTROL RESULTS SUMMARY METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: AAF-S-0028-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-26-88
Date Reported: 10-13-88
Dilution Factor: See Notes
%Moisture: 7.8

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082131-88082133, 88082043-88082049
88082100-88082104, 88082146-88082148

Laboratory Supervisor Approval:

[Signature]

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	C1	Duplicate C2	RPD	SA	Spike Recovery SR	SSR	PR	Notes
Arsenic	88082133	88082133	10-06-88	9-23-88	7060	<0.5	<5.0E	<5.0E	NC	4.34	2.71E	4.99E	53H	DF=10
Lead	88082133	88082133	10-04-88	9-23-88	7421	<0.5	2.82	3.53	22*	5.42	2.82	8.59	106	DF=11A

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

- * See Case Narrative attached.
- E See Legend attached.
- N See Legend attached.

$$\text{Relative Percent Difference (RPD)} = \frac{C1 - C2}{(C1 + C2)/2} \times 100$$

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

$$\text{Percent Recovery (PR)} = \frac{SSR - SR}{SA} \times 100$$

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

OC-FBI0115

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88082043-88082049, 88082100
SAMPLE NO(S).: 88082102, 88082104
SAMPLE NO(S).: 88082130-88082133
SAMPLE NO(S).: 88082146-88082148

As a result of extreme sample matrix interference, dilution was required for sample analysis. The reporting limit and MDL for the analyte(s) listed have increased as shown.

<u>Analyte</u>	<u>Reporting Limit</u>	<u>MDL</u>
Arsenic	10 mg/Kg	5.0 mg/Kg

Job No.:	OR001	QC Report No:	CVM-S-0014--88
Client:	ES Oak Ridge	Sample Matrix:	Soil
Attn:	Bill Hayden	Conc. Unit:	mg/KG
Address:	710 S. Illinois Avenue	Date Received:	8-26-88
	Suite F-103	Date Reported:	10-13-88
	Oak Ridge, Tn. 37830	Dilution Factor:	NA
		%Moisture:	8.4

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082130--88082133, 88082146--88082152
88082156--88082163

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Duplicate		Spike Recovery		PK	Notes
							C1	C2	SA	SR		
Mercury	88082130	88082130	9-21-88	9-21-88	7471	<0.1	<0.1	<0.1	<0.1	1.14	105	

2935

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

$$\text{Relative Percent Difference (RPD)} = \frac{C_1 - C_2}{(C_1 + C_2)/2} \times 100$$
$$\text{Percent Recovery (P\%)} = \frac{\text{SSR} - \text{SR} \times 100}{\text{SA}}$$

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
Samples No.: 88082130-88082133
Samples No.: 88082146-88082152

The results obtained for the laboratory control sample (LCS) analyzed with these samples for the analyte Mercury exceeded the recommended EPA recoveries. All data associated with this batch was closely inspected and no analytical problems were found. The initial and continuing calibration verification standards and blanks and precision and accuracy recoveries were within acceptable limits. The Mercury LCS was prepared at a concentration exceeding the linear range of the test.

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001 QC Report No: TPH-S-0055-88

Client: ES Oak Ridge Sample Matrix: Soil

Attn: Bill Hayden Conc. Unit: mg/KG

Address: 710 S. Illinois Avenue Date Received: 8-26-88

 Suite F-103 Date Prepared: 9-19-88

 Oak Ridge, Tn. 37830 Date Analyzed: 9-20-88

 Date Reported: 9-27-88

 Dilution Factor: 6

 %Moisture: 7.5

Project: Duluth ANGB Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88082130-88082133, 88082146-88082151
88082156-88082163

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88082132	418.1	<100	130	1100	710	65	770	70	8	*
2937										

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* Percent recovery and relative percent difference are within ES Laboratory control limits.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$ MS = Spike Sample NA = Not Applicable
MSD = Spike Duplicate NC = Not Calculated

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$ SR = Sample Result ND = Not Detected
SA = Spike Added (Concentration)

VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: VGC-S-0042-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 8-26-88
Date Prepared: NA
Date Analyzed: 9-07-88
Date Reported: 10-10-88
Dilution Factor: NA
% Moisture: 8.4

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88082043-88082049
88082099-88082104
88082130-88082133

[Signature]

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
88082130	Halocarbons: 8010									
	1,1-dichloroethane	10.9	ND	11.2	103	11.7	107	4	20	58-124
	Trichloroethene	10.9	ND	9.0	83	8.7	80	3	16	75-110
	Chlorobenzene	10.9	ND	9.0	83	9.3	85	3	21	71-125
88082130	Aromatics: 8020									
	Benzene	10.9	ND	9.7	89	9.3	85	4	26	75-123
	Toluene	10.9	0.7	9.8	83	9.7	83	1	16	79-115
	Chlorobenzene	10.9	ND	9.6	88	9.2	84	4	24	82-112

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

* The QC analysis was performed on the confirmatory column. Therefore, the sample result (SR) value for toluene is not the same as the one appearing on the final result form for the sample.

$$\text{Relative Percent Difference (PR)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

MS = Spike Sample

$$\text{Percent Recovery (PR)} = \frac{(\text{MS or MSD}) - \text{SR} \times 100}{\text{SA}}$$

MSD = Spike Sample Duplicate

SR = Sample Result

SA = Spike Added (Concentration)

NA = Not Applicable

NC = Not Calculated

ND = Not Detected

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830

Sample Matrix: Soil
 Conc. Unit: ug/KG
 Date Reported: 10-10-88

Laboratory Supervisor Approval:

Project: Duluth ANGB

AWB

File ID	Date Analyzed	Fraction	Instru- ment ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
15	9-01-88	VGC	Carbopack	75-09-2	Dichloromethane	3.6	0.25	88082099-88082104
50	9-03-88	VGC	Carbopack	75-09-2 67-66-3 71-55-6	Dichloromethane Chloroform 1,1,1-Trichloromethane	0.6 0.8 1.9	0.25 0.05 0.03	88082130-88082133

2939

**PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL**

Job No: 0R001
 Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830

QC Report No.: OCP-S-0030-88
 QC Sample No.: 88082104
 Level (Low/Med): Low
 Date Reported: 11-10-88

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
 88082102-88082104
 88082130-88082133
 88082146-88082148

Bill Hayden

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2190	ND	103	141*	46-127
Heptachlor	2190	ND	109	150*	35-130
Aldrin	2190	ND	118	162*	34-132
Dieldrin	5460	ND	320	176*	31-134
Endrin	5460	ND	286	157*	42-139
4,4'-DDT	5460	ND	299	164*	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits	
					RPD	REC
Lindane	77.3	106	141*	29	50	46-127
Heptachlor	84.4	116	150*	25	31	35-130
Aldrin	99.1	136*	162*	17	43	34-132
Dieldrin	256	141*	176*	22	38	31-134
Endrin	225	124	157*	24	45	42-139
4,4'-DDT	219	120	164*	31	50	23-134

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: 0 out of 6 outside limits

Spike Recovery: 8 out of 12 outside limits

**PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL**

Job No: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No.: OCP-S-9030-88B
QC Sample No.: Blank
Level (Low/Med): Low
Date Reported: 11-10-88

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88082102-88082104
88082130-88082133
88082146-88082148

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2000	ND	63.0	95	46-127
Heptachlor	2000	ND	67.8	102	35-130
Aldrin	2000	ND	78.6	118	34-132
Dieldrin	5000	ND	190	114	31-134
Endrin	5000	ND	149	89	42-139
4,4'-DDT	5000	ND	187	112	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits	
					RPD	REC
Lindane	43.5	65	95	37	50	46-127
Heptachlor	58.3	87	102	15	31	35-130
Aldrin	64.9	97	118	19	43	34-132
Dieldrin	171	103	114	11	38	31-134
Endrin	149	89	89	0	45	42-139
4,4'-DDT	154	92	112	19	50	23-134

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: 0 out of 6 outside limits

Spike Recovery: 0 out of 12 outside limits

PESTICIDE METHOD BLANK SUMMARY

Job No.:	OR001	Lab Name:	Engineering Science
		Lab Sample No.:	Blank
Client:	ES Oak Ridge	Matrix:	Soil
Attn:	Bill Hayden	Level (low/med):	Low
Address:	710 S. Illinois Avenue	Extraction:	
	Suite F-103	(SepF/Cont/Sonc):	Sonc
	Oak Ridge, Tn. 37830	Date Reported:	11-11-88

Project: Duluth ANGB

Date Extracted:	9-01-88	Date Analyzed (2):	
Date Analyzed (1):	9-27-88	Time Analyzed (2):	
Time Analyzed (1):	10:21	Instrument ID (2):	
Instrument ID (1):	5890 #2	GC Column ID (2):	
GC Column ID (1):	OV-1		

This Method Blank applies to the following samples, MS and MSD.

EPA Sample No.	Lab Sample ID (1)	Date Analyzed 1	Lab Sample ID (2)	Date Analyzed 2
-	88082102	9-27-88		
-	88082103	9-27-88		
-	88082104	9-27-88		
-	88082130	9-27-88		
-	88082131	9-27-88		
-	88082132	9-27-88		
-	88082133	9-27-88		
-	88082146	9-27-88		
-	88082147	9-27-88		
-	88082148	9-27-88		

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO.: OCP-S-0030-88
QC REPORT NO.: OCP-S-0030-88B

Percent recovery for some of the matrix spike and duplicate exceed EPA QC guidelines. Analysis of spiked blanks shows the laboratory to be in control.

Endrin aldehyde and Kepone were not recoverable because they were removed by the alumina column clean-up used on these samples.

Heptachlor epoxide was accidentally substituted for Heptachlor in the matrix spiking solution.

QUALITY CONTROL RESULTS SUMMARY EPA METHOD 8270

Job No.: OR001
 Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830

QC Report No: BNA-S-0027-88
 Sample Matrix: Soil
 Conc. Unit: ug/KG
 Date Received: 8-20-88
 Date Prepared: 8-31-88
 Date Analyzed: 9-22-88
 Date Reported: 12-13-88
 Dilution Factor: NA
 %Moisture: 5.5

Project: Duluth ANGB
 Laboratory Supervisor Approval: *[Signature]*

QC Report for Laboratory Sample No(s):
 88082130-88082133, 88082102-88082104
 88082146-88082148

Fraction	Compound	SA	SR	MS	PR	MSD	PR	RPD	EPA QC Limit RPD %Recovery
2944 B/N Laboratory Sample # 88082005	1,2,4-Trichlorobenzene	3550	ND	2090	59	2280	64	9	23 38-107
	Acenaphthene	3550	ND	2470	70	2820	79	13	19 31-137
	2,4-Dinitrotoluene	3550	ND	2430	68	2560	72	5	47 28-89
	Pyrene	3550	ND	2970	84	2720	77	9	36 35-142
	N-Nitroso-di-n-Propylamine	3550	ND	2420	68	2350	66	3	38 41-126
	1,4-Dichlorobenzene	3550	ND	1550	44	1440	41	7	27 28-104
ACID Laboratory Sample # 88082005	Pentachlorophenol	7090	ND	4850	68	6000	85	21	47 17-109
	Phenol	7090	ND	4750	67	5180	73	9	35 26-90
	2-Chlorophenol	7090	ND	4050	57	4580	65	12	50 25-102
	4-Chloro-3-Methylphenol	7090	ND	5130	72	5950	84	15	33 26-103
	4-Nitrophenol	7090	ND	2940	42	3000	42	5	50 11-114

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
 The quality control sample for this batch is from a different project.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

NA = Not Applicable
 NC = Not Calculated
 ND = Not Detected

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
 MSD = Spike Duplicate
 SR = Sample Result
 SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY EPA METHOD 8270

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082130Re, 88082133Re, 88082162Re-88082163Re
88082186Re, 88082198Re, 88092223Re-88092224Re
88092203Re, 88092226Re

QC Report No: BNA-S-0058-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 08-29-88
Date Prepared: 10-29-88
Date Analyzed: 12-21-88
Date Reported: 01-09-89
Dilution Factor: NA
%Moisture: 10

Laboratory Supervisor Approval:

[Signature]

2945

Fraction	Compound	SA	SR	MS	PR	MSD	PR	RPD	EPA QC Limit RPD %Recovery
B/N Laboratory Sample # 88082163Re	1,2,4-Trichlorobenzene	3700	ND	1630	44	2040	55	22	23 38-107
	Acenaphthene	3700	ND	2690	73	2240	61	18	19 31-137
	2,4-Dinitrotoluene	3700	ND	2570	69	1990	54	25	47 28-89
	Pyrene	3700	ND	3060	82	2570	69	17	36 35-142
	N-Nitroso-di-n-Propylamine	3700	ND	3182	86	2610	70	20	38 41-126
	1,4-Dichlorobenzene	3700	ND	2170	58	1890	51	14	27 28-104
ACID Laboratory Sample # 88082163Re	Pentachlorophenol	7410	ND	6830	97	4790	65	35	47 17-109
	Phenol	7410	ND	5720	77	5290	71	7	35 26-90
	2-Chlorophenol	7410	ND	4760	64	4370	59	8	50 25-102
	4-Chloro-3-Methylphenol	7410	ND	5720	77	4530	61	23	33 26-103
	4-Nitrophenol	7410	ND	6440	87	4640	63	32	50 11-114

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

METHOD BLANK SUMMARY

Job No:	OR001	Sample Matrix:	Soil
Client:	ES Oak Ridge	Conc. Unit:	ug/KG
Attn:	Bill Hayden	Date Reported:	12-12-88
Address:	710 S. Illinois Avenue Suite F-103 Oak Ridge, Tn. 37830	Laboratory Supervisor Approval:	<u><i>AWB</i></u>
Project:	Duluth ANGB		

File ID	Date Analyzed	Fraction	Instru- ment ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
E5863	10-13-88	BNA	2	-	None Detected	-	-	88082102-88082104 88082130-88082133 88082146-88082148
2946								

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO.: 88082130-88082133
WORK ORDER NO.: 918

The initial analysis of the samples in this work order were performed one day out of holding time. Results of the first analysis of samples 88082130 and 88082132 showed low area counts for one or more internal standards. The original extracts were re-analyzed with similar results. This indicates that the cause of the low internal standard area counts was an effect of the sample, rather than an equipment problem. Similarly, when sample 88082133 was first analyzed, some of the surrogate spike recoveries were below EPA QC limits. The sample extract was re-analyzed. This time, the surrogate spike recoveries were within limits, but the area counts of the latest eluting internal standards were low. Examination of the chromatograms of these three samples shows a pattern that might be obtained from a high-boiling hydrocarbon distillation cut. This interference could cause all of the above phenomenon.

418.1 INITIAL & CONTINUING CALIBRATION DATA

Job No.: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Calibration Date: 9-20-88
Instrument I.D.: Perkin Elmer 257
Grating Infrared Spectrophotometer

Unit: mg/L
Date Reported: 11-09-88
R= 0.9996

Project: Duluth ANCB

Laboratory Supervisor Approval:

Laboratory Sample No(s):
88082130-88082133

[Signature]

Standard	Concentration	Absorbance	/Continuous RF /Calibration /Verification
No. 1	0.59	0.097	RF = 7.63
No. 2	1.2	0.174	
No. 3	1.8	0.259	
No. 4	2.4	0.332	
Cont. Cal. No. 2 (88082130-88082133)	1.11	0.165	93%

SEMIVOLATILE METHOD BLANK SUMMARY

4B

Job No.:

Client:

Attn:

Address:

Work Order No.:

Lab Sample No.: 04-17

Lab File ID: E6734

Matrix: Soil

Level (low/med):

Date Analyzed: 2-23-89

Time Analyzed: 13:22

Instrument ID:

Date Reported:

Project:

Duluth

This Method Blank applies to the following samples, MS and MSD.

Sample Number	Lab Sample ID	Lab File ID	Date of Analysis
DANGB-3-MW35 SS3A	88082130 Rex	Not Needed	—
DANGB-3-MW35-SS3	88082133 Rex	Not Needed	—
DANGB-3-MW33 SS2 11-12	88082142 Rex	Not Needed	—
DANGB-3-MW33 SS3 20-21	88082163 Rex	S0339	11-2-88
DANGB-BG MW32 SS-1 2-3	88082186 Rex	Not Needed	—
DANGB-3MW29 SS-3	88082198 Rex	Not Needed	—
DANGB-3SG-E3 SS1A	88092203 Rex	Not Needed	—
DANGB-2BH1-SS6-15-17	88092223 Rex	S0335	11-2-88
DANGB-2BH1-SS7-22-24	88092224 Rex	S0337	11-2-88
DANGB-2BH2-SS5-20-22	88092226 Rex	S0338	11-2-88

2949

FILE CONTINUING CALIBRATION CHECK

Name: _____ Contract: _____

Code: _____ Case No.: _____ SAS No.: _____

Instrument ID: carbopak _____ Calibration Date(s): 9/30/88

FILE ID: 47,48 _____ Init. Calib. Date(s): 9/2/88, 9/2/88

FOUND	RRF	RRF50	%D
yl chloride _____	0.08		100.00
: (2-chloroethoxy)			
hane _____	0.04		100.00
: (2-chloroisopropyl			
er _____	0.26		100.00
mobenzene _____	1.32	1.31	0.57
modichloromethane _____	4.54	4.72	-4.08
moform _____	3.48	4.33	-24.50
momethane _____	0.38	0.44	-15.07
bon tetrachloride _____	4.58	4.59	-0.37
oroacetaldehyde _____			ERR
orobenzene _____	1.48	1.60	-7.82
oroethane _____	0.58	0.71	-21.56
oroform _____	4.89	5.23	-6.90
horohexane _____	1.02	1.05	-2.44
hloroethyl vinyl ether _____			ERR
romethane _____	0.49	0.58	-16.76
romethyl methyl ether _____	0.17	0.00	97.39
m, & p-Chlorotoluenes _____	4.06	4.26	-4.81
romochloromethane _____	5.29	5.37	-1.54
romomethane _____	3.56	3.89	-9.25
1-Dichlorobenzene _____	2.72	2.91	-6.81
1-Dichlorobenzene _____	2.42	2.60	-7.71
1-Dichlorobenzene _____	2.36	2.56	-8.47
hlorodifluoromethane _____	0.54	0.00	99.17
1-Dichloroethane _____	2.58	2.71	-5.09
1-Dichloroethane _____	3.23	3.45	-7.07
1-Dichloroethylene _____	2.79	3.41	-22.40
ns_1,2_dichloroethylene _____	2.99	3.15	-5.15
hloromethane _____	3.07	2.72	11.27
1-Dichloropropane _____	2.67	2.74	-2.88
1-Dichloropropylene _____	5.98	5.85	2.21
,2,2-Tetrachloroethane _____	9.09	9.22	-1.34
,1,2-Tetrachloroethane _____	4.51	4.57	-1.42
rachloroethylene _____	9.10	9.22	-1.36
,1-Trichloroethane _____	3.43	2.89	15.72
,2-Trichloroethane _____	5.98	5.85	2.17
hloroethylene _____	4.32	4.39	-1.52
hlorodifluoromethane _____	2.76	2.84	-2.71
hloropropane _____	3.33	3.27	1.86
hloroethane _____	1.43	1.48	-3.73

LABILE CONTINUING CALIBRATION CHECK

Name: ENGINEERING SCIENCE _____ Contract: _____

Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID.: carbopak Calibration Date(s): 9/3/88 _____

FILE ID: RRF 50 47 _____

Init. Calib. Date(s) 9/2/88

COMPOUND	RRF	RRF50	%D
Benzene	5.93	5.89	-0.66
Chlorobenzene	4.90	4.85	-0.93
1,2-Dichlorobenzene	3.97	4.15	4.42
1,3-Dichlorobenzene	3.57	4.80	34.45
1,4-Dichlorobenzene	3.83	4.09	6.81
Ethyl Benzene	3.32	3.33	0.22
Toluene	3.79	3.71	-2.13
Xylenes	12.16	11.95	-1.76

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DATA PACKAGE #56

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ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001.02

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the soil samples received
by this laboratory on 9-29-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88092734	DANGB-8-SL27-SD-1	BA-I	9-24-88		10-17-88	
88092734	DANGB-8-SL27-SD-1	CD-F	9-24-88		10-18-88	
88092734	DANGB-8-SL27-SD-1	CR-F	9-24-88		10-18-88	
88092734	DANGB-8-SL27-SD-1	PB-F	9-24-88		10-18-88	
88092734	DANGB-8-SL27-SD-1	418.1	9-24-88	10-13-88	10-22-88	
88092734	DANGB-8-SL27-SD-1	MOIS	9-24-88		10-10-88	
88092734	DANGB-8-SL27-SD-1	8010	9-24-88		10-06-88	10-04-88
88092734	DANGB-8-SL27-SD-1	8020	9-24-88		10-06-88	10-04-88
88092734	DANGB-8-SL27-SD-1	8080	9-24-88	10-07-88	10-25-88	
88092735	DANGB-8-SL17-SD-1	BA-I	9-24-88		10-17-88	
88092735	DANGB-8-SL17-SD-1	CD-F	9-24-88		10-19-88	
88092735	DANGB-8-SL17-SD-1	CR-F	9-24-88		10-18-88	
88092735	DANGB-8-SL17-SD-1	PB-F	9-24-88		10-18-88	
88092735	DANGB-8-SL17-SD-1	418.1	9-24-88	10-13-88	10-22-88	
88092735	DANGB-8-SL17-SD-1	MOIS	9-24-88		10-10-88	
88092735	DANGB-8-SL17-SD-1	8010	9-24-88		10-05-88	10-04-88
88092735	DANGB-8-SL17-SD-1	8020	9-24-88		10-05-88	10-04-88
88092735	DANGB-8-SL17-SD-1	8080	9-24-88	10-07-88	10-25-88	

* If applicable

89-DULU0813 1

A SUBSIDIARY OF THE PARSONS CORPORATION

2955

CL-FRM01



ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001.02

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
38092736	DANGB-8-SL18-SD-1	BA-I	9-24-88		10-17-88	
38092736	DANGB-8-SL18-SD-1	CD-F	9-24-88		10-19-88✓	
38092736	DANGB-8-SL18-SD-1	CR-F	9-24-88		10-18-88	
38092736	DANGB-8-SL18-SD-1	PB-F	9-24-88		10-25-88✓	
38092736	DANGB-8-SL18-SD-1	418.1	9-24-88	10-13-88	10-22-88	
38092736	DANGB-8-SL18-SD-1	MOIS	9-24-88		10-10-88	
38092736	DANGB-8-SL18-SD-1	8010	9-24-88		10-06-88	10-04-88
38092736	DANGB-8-SL18-SD-1	8020	9-24-88		10-06-88	10-04-88
38092736	DANGB-8-SL18-SD-1	8080	9-24-88	10-07-88	10-25-88	
38092737	DANGB-8-SL19-SD-1	BA-I	9-24-88		10-17-88	
38092737	DANGB-8-SL19-SD-1	CD-F	9-24-88		10-19-88	
38092737	DANGB-8-SL19-SD-1	CR-F	9-24-88		10-19-88✓	
38092737	DANGB-8-SL19-SD-1	PB-F	9-24-88		10-20-88✓	
38092737	DANGB-8-SL19-SD-1	418.	9-24-88	10-13-88	10-22-88	
38092737	DANGB-8-SL19-SD-1	MOIS	9-24-88		10-10-88	
38092737	DANGB-8-SL19-SD-1	8010	9-24-88		10-06-88	10-04-88
38092737	DANGB-8-SL19-SD-1	8020	9-24-88		10-06-88	10-04-88
38092737	DANGB-8-SL19-SD-1	8080	9-24-88	10-07-88	10-25-88	
38092738	DANGB-4-SL13-SD-1	BA-I	9-24-88		10-17-88	
38092738	DANGB-4-SL13-SD-1	CD-F	9-24-88		10-27-88	
38092738	DANGB-4-SL13-SD-1	CR-F	9-24-88		10-18-88	
38092738	DANGB-4-SL13-SD-1	PB-F	9-24-88		10-18-88	
38092738	DANGB-4-SL13-SD-1	418.1	9-24-88	10-13-88	10-22-88	
38092738	DANGB-4-SL13-SD-1	MOIS	9-24-88		10-10-88	
38092738	DANGB-4-SL13-SD-1	8010	9-24-88		10-05/09-88	10-07-88
38092738	DANGB-4-SL13-SD-1	8020	9-24-88		10-07-88	10-07-88

* If applicable



ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001.02

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88092739	DANGB-4-SL15-SD-1	BA-I	9-24-88		10-17-88	
88092739	DANGB-4-SL15-SD-1	CD-F	9-24-88		10-19-88	
88092739	DANGB-4-SL15-SD-1	CR-F	9-24-88		10-18-88	
88092739	DANGB-4-SL15-SD-1	PB-F	9-24-88		10-18-88	
88092739	DANGB-4-SL15-SD-1	418.1	9-24-88	10-13-88	10-22-88	
88092739	DANGB-4-SL15-SD-1	MOIS	9-24-88		10-10-88	
88092739	DANGB-4-SL15-SD-1	8010	9-24-88		10-05/06-88	10-06/07-88
88092739	DANGB-4-SL15-SD-1	8020	9-24-88		10-06-88	10-06/07-88
88092740	DANGB-4-SL14-SD-1	BA-I	9-24-88		10-17-88	
88092740	DANGB-4-SL14-SD-1	CD-F	9-24-88		10-19-88	
88092740	DANGB-4-SL14-SD-1	CR-F	9-24-88		10-18-88	
88092740	DANGB-4-SL14-SD-1	PB-F	9-24-88		10-18-88	
88092740	DANGB-4-SL14-SD-1	418.1	9-24-88	10-13-88	10-22-88	
88092740	DANGB-4-SL14-SD-1	MOIS	9-24-88		10-10-88	
88092740	DANGB-4-SL14-SD-1	8010	9-24-88		10-05-88	10-06-88
88092740	DANGB-4-SL14-SD-1	8020	9-24-88		10-06-88	
88092741	DANGB-4-SL26-SD-1	BA-I	9-24-88		10-17-88	
88092741	DANGB-4-SL26-SD-1	CD-F	9-24-88		10-19-88	
88092741	DANGB-4-SL26-SD-1	CR-F	9-24-88		10-18-88	
88092741	DANGB-4-SL26-SD-1	PB-F	9-24-88		10-18-88	
88092741	DANGB-4-SL26-SD-1	418.1	9-24-88	10-13-88	10-22-88	
88092741	DANGB-4-SL26-SD-1	MOIS	9-24-88		10-10-88	
88092741	DANGB-4-SL26-SD-1	8010	9-24-88		10-05/07-88	10-06/07-88
88092741	DANGB-4-SL26-SD-1	8020	9-24-88		10-05/07-88	10-06/07-88

* If applicable

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88092734-88092741
WORK ORDER NO.: 1049

These soil samples were received at the ES Berkeley Laboratory on 9-29-88. They were received cold and intact.

2958

01/26/89

ANALYSIS REPORT

WORK ORDER NUMBER: 1049
JOB NUMBER : Z80000000440
WORK ORDER DATE : 09/27/88

APPROVED BY 
Lab Supervisor

REPORT DATA:

ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:

ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

ASK: 2, UNITS: MG/KG

	DANGB-8-SL27- SD1	DANGB-8-SL17- SD1	DANGB-8-SL18- SD1	DANGB-8-SL19- SD1	DANGB-4-SL13- SD1	DANGB-4-SL15- SD1
TEST COMPOUND	88092734	88092735	88092736	88092737	88092738	88092739
ACID DIG SOIL	NA	NA	NA	NA	NA	NA
ARIUM	83.6	75.3	45.5	84.8 B	62.3	74.1
CADIUM	<2.1	<0.92	<0.61	<2.5	<0.89	<1.6
CHROMIUM	14.2SN	14.8 N	26.8 N	13.2*S	15.6SN	23.4 N
LEAD	19.4	6.5	5.7	11.5	15.8	23.1


ANALYSIS REPORT FOR WORK-ORDER NUMBER 1049

SK: 2, UNITS: MG/KG

ST COMPOUND	DANGB-4-SL14- SD1 88092740	DANGB-4-SL26- SD1 88092741
-----	-----	-----
ID DIG SOIL	NA	NA
RIUM	48.0	83.7
DMIUM	<0.82	<1.1
ROMIUM	5.9 N	15.1 N
AD	12.9	14.9

ANALYSIS REPORT

WORK ORDER NUMBER: 1049
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/27/88

APPROVED BY 
Lab Supervisor

REPORT DATA:

ES OAK RIDGE/DULUTH ANGB
0 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:

ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

ASK: 3, UNITS: mg/Kg

	DANGB-8-SL27- SD1	DANGB-8-SL17- SD1	DANGB-8-SL18- SD1	DANGB-8-SL19- SD1	DANGB-4-SL13- SD1	DANGB-4-SL15- SD1
EST COMPOUND	88092734	88092735	88092736	88092737	88092738	88092739
418.1 PETROLEUM HYDROCARBONS	3300	<100	<100	200	7000	640
MOISTURE	72.5	21.9	11.6	63.1	32.6	NT

ANALYSIS REPORT FOR WORK ORDER NUMBER 1049

SK: 3, UNITS: mg/Kg

	DANGB-4-SL14- SD1	DANGB-4-SL26- SD1
ST COMPOUND	88092740	88092741

8.1 PETROLEUM HYDROCARBONS	190	12000
MOISTURE	33.2	27.2

ANALYSIS REPORT

WORK ORDER NUMBER: 1049
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/27/88

APPROVED BY 
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

ASK: 4, UNITS: ug/Kg, GROUP 8010

	DANGB-8-SL27- SD1	DANGB-8-SL17- SD1	DANGB-8-SL18- SD1	DANGB-8-SL19- SD1	DANGB-4-SL13- SD1	DANGB-4-SL15- SD1
TEST COMPOUND	88092734	88092735	88092736	88092737	88092738	88092739
BENZYL CHLORIDE	ND	ND	ND	ND	ND	ND.
IS (2-CHLOROETHOXY)METHANE	ND	ND	ND	ND	ND	ND
IS (2-CHLOROISOPROPYL)ETHER	ND	ND	ND	ND	ND	ND
BROMOBENZENE	ND	ND	ND	ND	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND	ND	ND	ND
BROMOFORM	ND	ND	ND	ND	ND	ND
BROMOETHANE	ND	ND	ND	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND	ND	ND	ND
CHLORACETALDEHYDE	ND	ND	ND	ND	ND	ND
CHLORAL	ND	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND
CHLOROETHANE	ND	ND	ND	ND	ND	ND
CHLOROFORM	ND	14B	14B	27B	14B	ND
1-CHLOROHEXANE	ND	ND	ND	ND	ND	ND
1-CHLOROETHYL VINYL ETHER	ND	ND	ND	ND	ND	ND
CHLOROMETHANE	ND	ND	ND	ND	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND	ND	ND	ND	ND
CHLOROTOLUENE	ND	ND	ND	ND	ND	ND
DIBROMOCHLOROMETHANE	ND	ND	ND	ND	ND	ND
DIBROMOMETHANE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
DICHLOROMETHANE	84B	36B	34B	98B	46B	40B
1,2-DICHLOROPROPANE	ND	ND	ND	ND	ND	ND

01/26/89

ANALYSIS REPORT FOR WORK ORDER NUMBER 1049

ST COMPOUND	DANGB-8-SL27-	DANGB-8-SL17-	DANGB-8-SL18-	DANGB-8-SL19-	DANGB-4-SL13-	DANGB-4-SL15-
	SD1	SD1	SD1	SD1	SD1	SD1
	88092734	88092735	88092736	88092737	88092738	88092739
3-DICHLOROPROPYLENE	ND	ND	ND	ND	ND	ND
1,2,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
1,1,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
TRACHLOROETHYLENE	ND	ND	ND	ND	ND	ND
1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
1,2-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND
DICHLOROFLUOROMETHANE	ND	ND	ND	ND	ND	ND
DICHLOROPROPANE	ND	ND	ND	ND	ND	ND
NYL CHLORIDE	ND	ND	ND	ND	ND	ND

01/26/89

ANALYSIS REPORT FOR WORK ORDER NUMBER 1049

TASK: 4, UNITS: ug/Kg, GROUP 8010

	DANGB-4-SL14-	DANGB-4-SL26-
	SD1	SD1
	88092740	88092741

TEST COMPOUND

ENZYL CHLORIDE	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND
IS (2-CHLOROISOPROPYL)ETHER	ND	ND
ROMOBENZENE	ND	ND
BROMODICHLOROMETHANE	ND	ND
BROMOFORM	ND	ND
ROMOETHANE	ND	ND
CARBON TETRACHLORIDE	ND	ND
CHLORACETALDEHYDE	ND	ND
HLORAL	ND	ND
HLOROBENZENE	ND	ND
CHLOROETHANE	ND	ND
CHLOROFORM	ND	7.38
-CHLOROHEXANE	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND
CHLOROMETHANE	ND	ND
HLOROMETHYL METHYL ETHER	ND	ND
HLOROTOLUENE	ND	ND
DIBROMOCHLOROMETHANE	ND	ND
IBROMOMETHANE	ND	ND
,2-DICHLOROBENZENE	ND	ND
1,3-DICHLOROBENZENE	ND	ND
1,4-DICHLOROBENZENE	ND	ND
ICHLORODIFLUOROMETHANE	ND	ND
1,1-DICHLOROETHANE	ND	ND
1,2-DICHLOROETHANE	ND	ND
1,1-DICHLOROETHYLENE	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND
DICHLOROMETHANE	59B	62B
,2-DICHLOROPROPANE	ND	ND
,3-DICHLOROPROPYLENE	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND
1,1,1,2-TETRACHLOROETHANE	ND	ND
ETRACHLOROETHYLENE	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND
RICHLOROETHYLENE	ND	ND
RICHLOROFLUOROMETHANE	ND	ND
TRICHLOROPROPANE	ND	ND
VINYL CHLORIDE	ND	ND

01/26/89

ANALYSIS REPORT

ORK ORDER NUMBER: 1049
 IB NUMBER : ZB0000000440
 RK ORDER DATE : 09/27/88

APPROVED BY


 Lab Supervisor

PORT DATA:
 S OAK RIDGE/DULUTH ANGB
 O S. ILLINOIS AVE. STE. S103
 K RIDGE, TN 37830
 LL HAYDEN

CLIENT DATA:
 ES OAK RIDGE/DULUTH ANGB (134)
 710 S. ILLINOIS AVE. STE. S103
 OAK RIDGE, TN 37830

OF REPORT COPIES: 1

ONTRACT / PO # : OR001
 ONTACT : BILL HAYDEN
 (615)-481-3920

SK: 4, UNITS: ug/Kg, GROUP 8020

EST COMPOUND	DANGB-8-SL27- SD1 88092734	DANGB-8-SL17- SD1 88092735	DANGB-8-SL18- SD1 88092736	DANGB-8-SL19- SD1 88092737	DANGB-4-SL13- SD1 88092738	DANGB-4-SL15- SD1 88092739
BENZENE	ND	ND	ND	ND	ND	2.3
CHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
ETHYL BENZENE	ND	ND	ND	ND	44000	ND
TOLUENE	ND	ND	ND	ND	54000	5.5
XYLENES	ND	ND	ND	ND	690000	2.8

01/26/89

ANALYSIS REPORT FOR WORK ORDER NUMBER 1049

TASK: 4, UNITS: ug/Kg, GROUP 8020

TEST COMPOUND	DANB-4-SL14- SD1 88092740	DANB-4-SL26- SD1 88092741
BENZENE	ND	ND
CHLOROBENZENE	ND	ND
1,2-DICHLOROBENZENE	ND	ND
1,3-DICHLOROBENZENE	ND	ND
1,4-DICHLOROBENZENE	ND	ND
ETHYL BENZENE	ND	55000
TOLUENE	ND	26000
XYLENES	ND	250000

01/26/89

ANALYSIS REPORT

WORK ORDER NUMBER: 1049
 JOB NUMBER : ZB0000000440
 WORK ORDER DATE : 09/27/88

APPROVED BY

Lab Supervisor

PORT DATA:

1. OAK RIDGE/DULUTH ANGB
 0 S. ILLINOIS AVE. STE. S103
 OAK RIDGE, TN 37830
 BILL HAYDEN

CLIENT DATA:

ES OAK RIDGE/DULUTH ANGB (134)
 710 S. ILLINOIS AVE. STE. S103
 OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
 CONTACT : BILL HAYDEN
 (615)-481-3920

SK: 4, UNITS: ug/Kg, GROUP 8080

TEST COMPOUND	DANGB-8-SL27- SD1	DANGB-8-SL17- SD1	DANGB-8-SL18- SD1	DANGB-8-SL19- SD1
	88092734	88092735	88092736	88092737
DRIN	ND	ND	ND	ND
PHA-BHC	ND	ND	ND	ND
ETA-BHC	ND	ND	ND	ND
ELTA-BHC	ND	ND	ND	ND
MMA-BHC	ND	ND	ND	ND
LORDANE	ND	ND	ND	ND
4'-DDD	ND	ND	ND	ND
4'-DDE	ND	ND	ND	ND
4'-DDT	ND	ND	ND	ND
ELDRIN	ND	ND	ND	ND
DOSULFAN I	ND	ND	ND	ND
DOSULFAN II	ND	ND	ND	ND
DOSULFAN SULFATE	ND	ND	ND	ND
DRIN	ND	ND	ND	ND
DRIN ALDEHYDE	NA	NA	NA	NA
PTACHLOR	ND	ND	ND	ND
PTACHLOR EPOXIDE	ND	ND	ND	ND
EPONE	NA	NA	NA	NA
THOXYCHLOR	ND	ND	ND	ND
OXAPHENE	ND	ND	ND	ND
B-1016	ND	ND	ND	ND
B-1221	ND	ND	ND	ND
B-1232	ND	ND	ND	ND
B-1242	ND	ND	ND	ND
B-1248	ND	ND	ND	ND
B-1254	ND	ND	ND	ND
B-1260	ND	ND	ND	ND

QUALITY CONTROL RESULTS SUMMARY METALS

Job No.: OR001.02

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: AAF-S-0052-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 9-28-88
Date Reported: 1-31-89
Dilution Factor: NA
%Moisture: 43.2

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88092801-88092805, 88092737

[Signature]

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Cl	Duplicate C2	RPD	SA	Spike Recovery SR	SSR	PR	Notes
Arsenic	88092801	88092801	10-18-88	NA	7060	<1.0	<1.42	<1.42	NC	14.1	<1.42	11.9	84	
Cadmium	88092801	88092801	10-20-88	NA	7131	<0.50	<0.88	<0.88	NC	3.52	<0.88	3.87	110	
Chromium	88092801	88092801	10-20-88	NA	6010	<1.0	21.9	16.9	26*	7.04	21.9	30.2	118	
Lead	88092801	88092801	10-25-88	NA	7421	<0.50	6.76S	7.88	15	7.04	6.76S	12.7	85	

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

* See Legend attached.
S See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$ C1 = Concentration One NA = Not Applicable
C2 = Concentration Two NC = Not Calculated

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$ SSR = Spiked Sample Result ND = Not Detected
SR = Sample Result
SA = Spike Added (Concentration)

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88092737, 88092801-88092805

The detection limit for the analyte(s); arsenic, cadmium, chromium, lead, barium and mercury are provided by the sub-contract laboratory and based on a dry-weight of the sample.

QUALITY CONTROL RESULTS SUMMARY
METALS

Job No.: OR001.02

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: AAF-S-0051-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 9-24-88
Date Reported: 1-31-89
Dilution Factor: NA
%Moisture: 19.3

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88092672-88092676, 88092731-88092741
88092781-88092783, 88092799-88092800



Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	C1	Duplicate C2	RPD	SA	Spike Recovery SR	SSR	PR	Notes
Arsenic	88092672	88092672	10-16-88	NA	7060	<1.0	<1.24	<1.24	NC	9.91	<1.24	7.96	80	
Cadmium	88092672	88092672	10-17-88	NA	7131	<0.50	<0.62	<0.62	NC	2.48	<0.62	2.73	110	
Chromium	88092672	88092672	10-18-88	NA	6010	<1.0	14.2	12.5	13	4.96	14.2	25.8	234N	
Lead	88092672	88092672	10-16-88	NA	7421	<0.50	3.97	3.44	1	4.96	3.97	7.68	75	

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
N See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$
C1 = Concentration One
C2 = Concentration Two
NA = Not Applicable
NC = Not Calculated
ND = Not Detected

Percent Recovery (PR) = $\frac{SSR - SR \times 100}{SA}$
SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY METALS

Job No.: OR001.02

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: ICP-S-0048-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 9-28-88
Date Reported: 1-31-89
Dilution Factor: NA
%Moisture: 43.2

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88092801-88092805, 88092737

[Signature]

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	Cl	C2	RPD	SA	Spike Recovery		Notes
											SR	SSR	
Barium	88092801	88092801	10-17-88	NA	6010	<20	52.2	60.2	1	704	52.2	732	97

22973

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$ C1 = Concentration One C2 = Concentration Two NA = Not Applicable, NC = Not Calculated, ND = Not Detected

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$ SSR = Spiked Sample Result SR = Sample Result SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY METALS

Job No.: OR001.02

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: CVM-S-0028-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 9-28-88
Date Reported: 1-31-89
Dilution Factor: NA
%Moisture: 43.2

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
38092801-88092805, 88092737



Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal.	Date Prep	Anal Method	Blank	C1	Duplicate C2	RPD	SA	SR	Spike Recovery SSR	PR	Notes
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Mercury	88092801	88092801	10-17-88	NA	7471	<0.10	<0.18	<0.18	NC	0.88	<0.18	0.88	100	
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2374

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$ C1 = Concentration One C2 = Concentration Two
NA = Not Applicable
NC = Not Calculated
ND = Not Detected

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$ SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

Job No.: OR001.02

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: DuLuth ANGB

QC Report for Laboratory Sample No(s):

88092672-88092676, 88092731-88092741
88092781-88092783, 88092799-88092800

QC Report No:	CVM-S-0027-88
Sample Matrix:	Soil
Conc. Unit:	mg/KG
Date Received:	9-24-88
Date Reported:	1-31-89
Dilution Factor:	NA
%Moisture:	19.3

Laboratory Supervisor Approval:

Chas Powell

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	C1	Duplicate C2	RPD	SA	Spike Recovery SR	SSR	PR	Notes
Mercury	88092672	88092672	10-17-88	NA	7471	<0.10	<0.12	<0.12	NC	0.620	<0.12	0.680	110	

2975

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

$$\text{Relative Percent Difference (RPD)} = \frac{C1 - C2}{(C1 + C2)/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{\text{SSR} - \text{SR} \times 100}{\text{SA}}$$

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concent

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88092672-88092676, 88092731-88092741
SAMPLE NO(S).: 88092781-88092783, 88092799-88092800

The detection limit for the analyte(s); arsenic, cadmium, chromium, lead, barium and mercury are provided by the sub-contract laboratory and based on a dry-weight of the sample.

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OK001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88092672-88092676
88092731-88092741

QC Report No: TPII-S-0063-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 9-24-88
Date Prepared: 10-13-88
Date Analyzed: 10-22-88
Date Reported: 11-01-88
Dilution Factor: 7
%Moisture: 24.3

Laboratory Supervisor Approval:

[Signature]

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88092672	418.1	<100	<100	1320	1250	106	1290	98	3	
Blank	418.1	<100	<100	1000	1100	110	1000	100	10	

2977

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

$$\text{Relative Percent Difference (RPD)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{\text{SR} - \text{SR}}{\text{SA}} \times 100$$

HA = Not Applicable
NC = Not Calculated
HD = Not Detected

SR = Sample Result
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: VGC-S-0060-88
Sample Matrix: Soil
Conc. Unit: ug/Kg
Date Received: 9-27-88
Date Prepared: NA
Date Analyzed: 10-10-88
Date Reported: 11-03-88
Dilution Factor: NA
% Moisture: NT

Project: Duluth ANGB
Laboratory Supervisor Approval: AWB

QC Report for Laboratory Sample No(s):
88092672-88092676, 88092731-88092741
88092781-88092783, 88082255

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits Recovery
88092739	Halocarbons: 3010									
	1,1-dichloroethane	10	ND	8.32	83	5.50	55*	41*	20	53-124
	Trichloroethene	10	ND	7.90	79	6.34	63*	22*	16	75-110
	Chlorobenzene	10	ND	6.06	61*	5.21	52*	15	21	71-125
88092739 2978	Aromatics: 8020									
	Benzene	10	2.3	13.8	115	8.33	60*	49*	26	75-123
	Toluene	10	5.5	16.6	111	11.3	58*	38*	16	79-115
	Chlorobenzene	10	ND	9.40	94	8.21	82*	14	24	82-112

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

* See Case Narrative attached.

$$\text{Relative Percent Difference (PR)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(\text{NS or MSD}) - \text{SR} \times 100}{\text{SA}}$$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected
NT = Not Tested

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001
Client: ES Oak Ridge,
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: WCC-S-00660-88B
Sample Matrix: Soil
Conc. Unit: ug/kg
Date Received: NA
Date Prepared: NA
Date Analyzed: 10-10-88
Date Reported: 11-03-88
Dilution Factor: NA
% Moisture: NA

Project: Duluth ANGB
Laboratory Supervisor Approval: ANDBurton

QC Report for Laboratory Sample No(s):
88092672-88092676, 88092731-88092741
88092781-88092783, 88082255

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits Recovery
Blank	Halocarbons: 3010									
	1,1-dichloroethane	10	ND	9.46	95	10.4	104	9	20	58-124
	Trichloroethene	10	ND	9.33	93	9.61	96	3	16	75-110
	Chlorobenzene	10	ND	8.78	88	9.11	91	4	21	71-125
Blank	Aromatics: 8020									
	Benzene	10	ND	9.24	92	10.0	100	8	26	75-124
	Toluene	10	ND	9.38	94	9.53	95	2	16	79-115
	Chlorobenzene	10	ND	9.10	91	9.25	91	2	24	82-111

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

$$\text{Relative Percent Difference (PR)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(\text{MS or MSD}) - \text{SR} \times 100}{\text{SA}}$$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO(S).: VGC-S-0060-88
QC REPORT NO(S).: VGC-S-0060-88B

Percent recovery and relative percent difference for some of the matrix spiking compounds are outside ES Laboratory acceptance limits. A blank spike analysis shows the laboratory to be in control.

Results for Sample No. 88092739 are reported on a wet weight basis, since percentage moisture was not performed.

METHOD BLANK SUMMARY

Job No:	OR001	Sample Matrix:	Soil
Client:	ES Oak Ridge	Conc. Unit:	ug/Kg
Attn:	Bill Hayden	Date Reported:	11-04-88
Address:	710 S. Illinois Avenue Suite F-103 Oak Ridge, Tn. 37830	Laboratory Supervisor Approval:	<u><i>Bill Hayden</i></u>
Project:	Duluth ANGB		

File ID	Date Analyzed	Fraction	Instru- ment ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
60	10-05-88	VGC	Porasil	75-09-2 67-66-3	Dichloromethane Chloroform	1.9 0.35	0.25 0.05	88092731-88092733, 88092735-88092737, 88092740
69	10-06-88	VGC	Carbopack	75-09-2 107-06-2	Dichloromethane 1,2-Dichloroethane	11 0.37	0.25 0.03	88092734, 88092739
88	10-07-88	VGC	Carbopack	75-09-2 67-66-3	Dichloromethane Chloroform	2.2 0.20	0.25 0.05	88092738, 88092741

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job #: 0R001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No.: OCP-5-0137-388
QC Sample No.: Blank
Level (Low/Med): Low
Date Reported: 11-03-88

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s).:
88092672-88092674, 88092731-88092737
88092782-88092783

[Signature]

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2000	ND	37.0	56	46-127
Heptachlor	2000	ND	42.5	64	35-130
Aldrin	2000	ND	37.5	56	34-132
Dieldrin	5000	ND	115	69	31-134
Endrin	5000	ND	88.8	53	42-139
4,4'-DDT	5000	ND	99.0	60	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits	
					RPD	REC
Lindane	50.7	76	56	31	50	46-127
Heptachlor	49.0	74	64	14	31	35-130
Aldrin	39.8	60	56	6	43	34-132
Dieldrin	130	78	69	12	38	31-134
Endrin	108	65	53	20	45	42-139
4,4'-DDT	211	127	60	72*	50	23-134

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: 1 out of 6 outside limits

Spike Recovery: 0 out of 12 outside limits

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: 0R001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No.: OCF-3-0017-38
QC Sample No.: 88092674
Level (Low/Med): Low
Date Reported: 11-13-88

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s).:
88092672-88092674, 88092731-88092737
88092782-88092783

W.B. Jones

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2360	ND	49.2	62	46-127
Heptachlor	2360	ND	49.8	63	35-130
Aldrin	2360	ND	ND	NC*	34-132
Dieldrin	5910	ND	144	73	31-134
Endrin	5910	ND	122	62	42-139
4,4'-DDT	5910	ND	160	81	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits	
					RPD	REC
Lindane	59.5	76	62	19	50	46-127
Heptachlor	66.7	85	63	29	31	35-130
Aldrin	49.5	63	NC*	NC*	43	34-132
Dieldrin	151	92	73	23	38	31-134
Endrin	152	77	62	22	45	42-139
4,4'-DDT	145	74	81	9	50	23-134

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: 1 out of 6 outside limits

Spike Recovery: 1 out of 12 outside limits

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO.: OCP-S-0037-88
QC REPORT NO.: OCP-S-0037-88B

Matrix spike concentration is not detected for aldrin, therefore, spike recovery and relative percent difference are not calculated. A blank spike analysis shows the laboratory to be in control.

Endrin aldehyde and Kepone were not recoverable because they were removed by the alumina column clean-up required by these samples.

PESTICIDE METHOD BLANK SUMMARY

Job No.: OR001 Lab Name: Engineering Science
 Client: ES Oak Ridge Lab Sample No.: Blank
 Attn: Bill Hayden Matrix: Soil
 Address: 710 S. Illinois Avenue Level (low/med): Low
 Suite F-103 Extraction:
 Oak Ridge, Tn. 37830 (SepF/Cont/Sonc): Sonc
 Date Reported: 11-03-88

Project: Duluth ANGB

Date Extracted: 10-07-88
 Date Analyzed (1): 10-25-88 Date Analyzed (2): 10-26-88
 Time Analyzed (1): 11:47 Time Analyzed (2): 09:23
 Instrument ID (1): 5890 #2 Instrument ID (2): 5880
 GC Column ID (1): OV-1 GC Column ID (2): Mixed

This Method Blank applies to the following samples, MS and MSD.

EPA Sample No.	Lab Sample ID (1)	Date Analyzed 1	Lab Sample ID (2)	Date Analyzed 2
-	88092731	10-25-88	88092731	10-26-88
-	88092732	10-25-88	88092732	10-26-88
-	88092733	10-25-88	88092734	10-26-88
-	88092734	10-25-88	88092735	10-26-88
-	88092735	10-25-88	88092736	10-26-88
-	88092736	10-25-88	88092737	10-26-88
-	88092737	10-25-88	88092782	10-26-88
-	88092782	10-25-88	88092783	10-26-88
-	88092783	10-25-88		

file: CONTINL
24 Oct 88.

VOLATILE CONTINUING CALIBRATION CHECK

LabName: _____ Contract: _____
Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____
Instrument ID.: Carlisle Calibration Date(s): 10/6/88
LAB FILE ID: 66;67 Init. Calib. Date(s): 10/4/88

COMPOUND	RRF	RRF50	%D
Benzyl chloride	0.32	0.19	40
bis (2-chloroethoxy methane			
bis (2-chloroisopropyl ether			
Bromobenzene	1.4	1.0	28
Bromodichloromethane	3.9	3.8	2
Bromoform	1.9	1.9	0
Bromomethane		0.20	
Carbon tetrachloride	4.5	4.2	7
Chloroacetaldehyde			
Chlorobenzene	1.4	1.5	7
Chloroethane	0.44	0.58	14
Chloroform	4.4	4.5	2
1-Chlorohexane	1.2	0.93	
2-Chloroethyl vinyl ether			
Chloromethane	0.55	0.63	27
Chloromethyl methyl ether		3.8	
o, m, & p-Chlorotoluenes	4.6	3.8	80
Dibromochloromethane	3.8	3.8	0
Dibromomethane	3.2	2.3	66
1,2-Dichlorobenzene	2.6	2.2	15
1,3-Dichlorobenzene	2.3	1.9	17
1,4-Dichlorobenzene	2.3	1.9	17
Dichlorodifluoromethane			
1,1-Dichloroethane	2.3	2.3	0
1,2-Dichloroethane	3.3	2.7	18
1,1-Dichloroethylene	2.7	2.4	11
trans-1,2-dichloroethylene	2.6	2.3	12
Dichloromethane	11	6.8	38
1,2-Dichloropropane	2.4	2.2	8
1,3-Dichloropropylene	1.9	4.5 1.9	0
1,1,2,2-Tetrachloroethane	7.7	6.8	12
1,1,1,2-Tetrachloroethane	5.2	4.1	21
Tetrachloroethylene	7.7	6.8	12
1,1,1-Trichloroethane	3.2	3.0	6
1,1,2-Trichloroethane	5.9	4.5	24
Trichloroethylene	3.8	3.8	0
Trichlorofluoromethane	2.5	2.0	20
Trichloropropane	2.1	1.2	43
Vinyl chloride	0.7	0.82	5

file: 8020CONT
3 Nov 88

VOLATILE CONTINUING CALIBRATION CHECK

LabName: _____ Contract: _____
Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____
Instrument ID.: Carborak Calibration Date(s): 10/6/88
LAB FILE ID: 66 Init. Calib. Date(s): 10/4/88

COMPOUND	RRF	RRF50	%D
Benzene	4.3	4.5	5
Chlorobenzene	5.0	5.2	4
1,2_Dichlorobenzene	3.8	3.6	5
1,3_Dichlorobenzene	4.4	4.4	0
1,4_Dichlorobenzene	3.6	3.6	0
Ethyl Benzene	3.4	3.2	6
Toluene	3.8	3.9	2
Xylenes	12	12	0

FILE: CONTROL
24 Oct 88

VOLATILE CONTINUING CALIBRATION CHECK

LabName: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID.: _____ Calibration Date(s): 10/7/88

LAB FILE ID: 789, 790 Init. Calib. Date(s): 9/19/88 9/23/88

COMPOUND	RRF	RRF50	%D
Benzyl chloride	0.32	0.34	6
bis (2-chloroethoxy methane	—	—	—
bis (2-chloroisopropyl ether	—	—	—
Bromobenzene	1.4	1.0	29
Bromodichloromethane	3.7	4.1	11
Bromoform	1.7	1.7	0
Bromomethane	0.20	0.22	10
Carbon tetrachloride	4.2	4.5	7
Chloroacetaldehyde	—	—	—
Chlorobenzene	1.4	1.4	0
Chloroethane	0.72	0.45	38
Chloroform	3.9	4.7	21
1-Chlorohexane	1.2	0.96	20
2-Chloroethyl vinyl ether	—	—	—
Chloromethane	0.46	0.58	2.6
Chloromethyl methyl ether	—	—	—
o, m, & p-Chlorotoluenes	4.6	3.9	15
Dibromochloromethane	3.7	3.8	3
Dibromomethane	3.2	3.2	34
1,2-Dichlorobenzene	2.5	2.5	0
1,3-Dichlorobenzene	2.1	2.2	5
1,4-Dichlorobenzene	2.3	2.2	7
Dichlorodifluormethane	—	—	—
1,1-Dichloroethane	2.4	2.6	8
1,2-Dichloroethane	2.6	3.0	15
1,1-Dichloroethylene	2.6	2.8	8
trans-1,2-dichloroethylene	2.4	2.7	13
Dichloromethane	4.1	4.2	2
1,2-Dichloropropane	2.5	2.3	8
1,3-Dichloropropylene	5.9	4.5	24
1,1,2,2-Tetrachloroethane	7.5	7.2	4
1,1,1,2-Tetrachloroethane	5.2	4.1	21
Tetrachloroethylene	7.5	7.2	4
1,1,1-Trichloroethane	3.8	3.3	10
1,1,2-Trichloroethane	5.9	4.5	24
Trichloroethylene	4.0	3.9	8
Trichlorofluoromethane	2.3	2.5	9
Trichloropropane	2.1	1.4	33
Vinyl chloride	0.90	0.88	6

file: 8020CONT
3 Nov 88

VOLATILE CONTINJING CALIBRATION CHECK

LabName: _____ Contract: _____
Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____
Instrument ID.: _____ Calibration Date(s): 10/7/88
LAB FILE ID: #89 Int. Calib. Date(s): 9/19/88 9/23/88

COMPOUND	RRF	RRF50	%D
Benzene	4.9	4.2	14
Chlorobenzene	5.3	5.3	0
1,2_Dichlorobenzene	4.4	3.3	25
1,3_Dichlorobenzene	5.0	3.9	22
1,4_Dichlorobenzene	4.7	3.3	20
Ethyl Benzene	4.4	3.7	16
Toluene	3.9	3.4	8
Xylenes	1.3	1.0	23

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DATA PACKAGE #57

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ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the water samples received
by this laboratory on 9-19-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88092509	DANGB-4-GW4C-GW1	BA-I	9-16-88		10-13-88	
88092509	DANGB-4-GW4C-GW1	CD-F	9-16-88		10-20-88	
88092509	DANGB-4-GW4C-GW1	CR-F	9-16-88		10-16-88	
88092509	DANGB-4-GW4C-GW1	PB-F	9-16-88		10-16-88	
88092509	DANGB-4-GW4C-GW1	418.1	9-16-88	9-28-88	10-05-88	
88092509	DANGB-4-GW4C-GW1	8010	9-16-88		9-21-88	
88092509	DANGB-4-MW52-GW1	8020	9-16-88		9-21-88	
88092510	DANGB-4-MW52-GW1	BA-I	9-16-88		10-13-88	
88092510	DANGB-4-MW52-GW1	CD-F	9-16-88		10-26-88	
88092510	DANGB-4-MW52-GW1	CR-F	9-16-88		10-16-88	
88092510	DANGB-4-MW52-GW1	PB-F	9-16-88		10-16-88	
88092510	DANGB-4-MW52-GW1	418.1	9-16-88	9-28-88	10-05-88	
88092510	DANGB-4-MW52-GW1	8010	9-16-88		9-21-88	
88092510	DANGB-4-MW52-GW1	8020	9-16-88		9-21-88	

* If applicable

88-A1-DULU0418 1

2993

CL-FRM01

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88092509-88092510
WORK ORDER NO.: 1005

These water samples were received at the ES Berkeley Laboratory on 9-19-88. They were received cold and intact.

ANALYSIS REPORT

WORK ORDER NUMBER: 1005
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/19/88

APPROVED BY *Bill Hayden*
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 2, UNITS: mg/L

TEST COMPOUND	DANGB-4-GW4C- GW-1 88092509	DANGB-4-MW52- GW-1 88092510
ACID DIG FLAME	NA	NA
ACID DIG FURNACE	NA	NA
BARIUM	<0.2	<0.2
CADMIUM	<0.005	<0.005
CHROMIUM	<0.1	<0.01
LEAD	<0.005	<0.005

ND - Not Detected

11/29/88

ANALYSIS REPORT

WORK ORDER NUMBER: 1005
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/19/88

APPROVED BY


Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

: OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 3, UNITS: mg/L

TEST COMPOUND	DANGB-4-GW4C- GW-1 88092509	DANGB-4-MW52- GW-1 88092510
18.1 PETROLEUM HYDROCARBONS	<1.5	<1.5

ID - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 1005
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/19/88

APPROVED BY


Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/L, GROUP 8010

TEST COMPOUND	DANGB-4-GW4C- GW-1 88092509	DANGB-4-MW52- GW-1 88092510
BENZYL CHLORIDE	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND
BIS (2-CHLOROISOPROPYL) ETHER	ND	ND
BROMOBENZENE	ND	ND
BROMODICHLOROMETHANE	ND	ND
BROMOFORM	ND	ND
BROMOETHANE	ND	ND
CARBON TETRACHLORIDE	ND	ND
CHLORACETALDEHYDE	ND	ND
CHLORAL	ND	ND
CHLOROBENZENE	ND	ND
CHLOROETHANE	ND	ND
CHLOROFORM	ND	ND
1-CHLOROHEXANE	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND
CHLOROMETHANE	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND
CHLOROTOLUENE	ND	ND
DIBROMOCHLOROMETHANE	ND	ND
DIBROMOMETHANE	ND	ND
1,2-DICHLOROBENZENE	ND	ND
1,3-DICHLOROBENZENE	ND	ND
1,4-DICHLOROBENZENE	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND
1,1-DICHLOROETHANE	ND	ND
1,2-DICHLOROETHANE	ND	ND
1,1-DICHLOROETHYLENE	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND
DICHLOROMETHANE	ND	ND
1,2-DICHLOROPROPANE	ND	ND

ND - Not Detected

ENGINEERING-SCIENCE INC.
11/29/88

PAGE 4

ANALYSIS REPORT FOR WORK ORDER NUMBER 1005

TEST COMPOUND	DANGB-4-GW4C- GW-1 88092509	DANGB-4-MW52- GW-1 88092510
1,3-DICHLOROPROPYLENE	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND
1,1,1,2-TETRACHLOROETHANE	ND	ND
TETRACHLOROETHYLENE	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND
TRICHLOROETHYLENE	ND	ND
TRICHLOROFLUOROMETHANE	ND	ND
TRICHLOROPROPANE	ND	ND
VINYL CHLORIDE	ND	ND

ND - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 1005
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 09/19/88

APPROVED BY


Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/L, GROUP 8020

TEST COMPOUND	DANGB-4-GW4C- GW-1 88092509	DANGB-4-MW52- GW-1 88092510
BENZENE	ND	ND
CHLOROBENZENE	ND	ND
1,2-DICHLOROBENZENE	ND	ND
1,3-DICHLOROBENZENE	ND	ND
1,4-DICHLOROBENZENE	ND	ND
ETHYL BENZENE	ND	ND
TOLUENE	ND	ND
XYLENES	ND	ND

ND - Not Detected

CHAIN OF CUSTODY RECORD

[illegible]

QUALITY CONTROL RESULTS SUMMARY METALS

Job No.: OR001.02 QC Report No: AAF-W-0053-88


Client: ES Oak Ridge Sample Matrix: Water

Attn: Bill Hayden Conc. Unit: mg/L

Address: 710 S. Illinois Avenue Date Received: 9-17-88

 Suite F-103 Date Reported: 2-27-89

 Oak Ridge, Tn. 37830 Dilution Factor: NA

Project: Duluth ANGB Laboratory Supervisor Approval: 

QC Report for Laboratory Sample No(s):

88092487-88092488, 88092492, 88092494-88092495

88092509-88092511, 88092513-88092516

88092523-88092528, 88092546-88092547

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	C1	Duplicate C2	RPD	SA	Spike Recovery		Notes
											SR	SSR	
Arsenic	88092487	88092487	10-15-88	NA	7060	<0.01	<0.01	<0.01	NC	0.040	<0.01	0.041	102
Cadmium	88092487	88092487	10-20-88	NA	6010	<0.005	<0.05	<0.05	NC	0.010	<0.05	0.0114	114
Chromium	88092487	88092487	10-16-88	NA	6010	<0.01	<0.01	<0.01	NC	0.020	<0.01	0.0216	108
Lead	88092487	88092487	10-16-88	NA	7421	<0.005	<0.05	<0.005	NC	0.020	<0.05	0.0222	111

$$\text{Relative Percent Difference (RPD)} = \frac{C1 - C2}{(C1 + C2)/2} \times 100$$

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

$$\text{Percent Recovery (PR)} = \frac{SSR - SR}{SA} \times 100$$

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY METALS

Job No.: OR001.02

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: ICP-W-0060-88
Sample Matrix: Water
Conc. Unit: mg/L
Date Received: 9-17-88
Date Reported: 2-27-89
Dilution Factor: NA

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):

88092487-88092488, 88092492, 88092494-88092495
88092509-88092511, 88092513-88092516
88092523-88092528, 88092546-88092547

Laboratory Supervisor Approval:



Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	C1	Duplicate C2	RPD	SA	Spike Recovery SR	SSR	PR	Notes
Barium	88092487	88092487	10-13-88	NA	6010	<0.2	<0.2	<0.2	NC	2.0	<0.2	0.198	99	
3002														

$$\text{Relative Percent Difference (RPD)} = \frac{C1 - C2}{(C1 + C2)/2} \times 100$$

C1 = Concentration One
C2 = Concentration Two

$$\text{Percent Recovery (PR)} = \frac{SSR - SR}{SA} \times 100$$

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QC-FRM04W

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001 QC Report No: TPH-W-0070-88
Client: ES Oak Ridge Sample Matrix: Water
Attn: Bill Hayden Conc. Unit: mg/L
Address: 710 S. Illinois Avenue Date Received: NA
Suite F-103 Date Prepared: 9-28-88
Oak Ridge, Tn. 37830 Date Analyzed: 10-05-88
 Date Reported: 11-01-88
 Dilution Factor: NA

Project: Duluth ANGB Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88092422, 88092424-88092427, 88092433
88092509-88092511, 88092513, 88092515-88092516
88092346, 88092348, 88092350, 88092494-88092495

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88092516	418.1	<1.5	<1.5	39.5	29.6	75	30.4	77	3	*
3004										

* Reporting limit for the samples in this batch is provided by the sub-contract laboratory.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$ MS = Spike Sample NA = Not Applicable
MSD = Spike Duplicate NC = Not Calculated
Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$ SR = Sample Result ND = Not Detected
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: VGC-W-0048-88
Sample Matrix: Water
Conc. Unit: ug/L
Date Received: NA
Date Prepared: NA
Date Analyzed: 10-03-88
Date Reported: 10-25-88
Dilution Factor: NA

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88092487-88092495
88092509-88092516
88092523-88092526

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
88092525	Halocarbons: 8010									
	1,1-Dichloroethane	10	ND	9.26	93	9.54	95	3	26	70-130
	Trichloroethene	10	ND	9.89	99	10.3	103	4	19	65-131
	Chlorobenzene	10	ND	10.4	104	10.3	103	1	40	59-137
88092525	Aromatics: 8020									
	Benzene	10	ND	8.84	88	10.6	106	18	20	56-146
	Toluene	10	ND	10.1	101	10.1	101	0	41	42-150
	Chlorobenzene	10	ND	10.1	101	10.1	101	0	36	76-133

$$\text{Relative Percent Difference (PR)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(\text{MS or MSD}) - \text{SR}}{\text{SA}} \times 100$$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)
NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830

Sample Matrix: Water
 Conc. Unit: ug/L
 Date Reported: 11-01-88

Laboratory Supervisor Approval:

[Signature]

Project: Duluth ANGB

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
64	9-21-88	VGC	Vocol	75-09-2 67-66-3	Dichloromethane Chloroform	3.1 0.37	0.25 0.05	88092501-88092511
3006								

check 50.d

9/21/88

VOLATILE CONTINUING CALIBRATION CHECK

LabName: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID.: CARBopak Calibration Date(s): 9/21/89

LAB FILE ID: 12,13 Init. Calib. Date(s): 9/19/89 9/14/89

COMPOUND	RRF	RRF50	%D
Benzyl chloride	0.32	0.17	47
bis (2-chloroethoxy methane	-		
bis (2-chloroisopropyl ether			
Bromobenzene	1.0	1.2	20
Bromodichloromethane	3.7	3.7	0
Bromoform	1.9	2.2	16
Bromomethane	0.20	0.15	25
Carbon tetrachloride	4.2	4.4	5
Chloroacetaldehyde	-		
Chlorobenzene	1.4	1.5	7
Chloroethane	0.72	0.48	33
Chloroform	5.4	4.3	20
1-Chlorohexane	0.37	0.96	10
2-Chloroethyl vinyl ether			
Chloromethane	0.47	0.42	11
Chloromethyl methyl ether	-		
o,m,& p-Chlorotoluenes	3.5	3.8	9
Dibromochloromethane	3.7	3.9	5
Dibromomethane	2.4	2.4	0
1,2_Dichlorobenzene	2.5	2.7	8
1,3_Dichlorobenzene	2.1	1.6	24
1,4_Dichlorobenzene	2.1	1.9	10
Dichlorodifluormethane	-		
1,1_Dichloroethane	2.1	2.3	4
1,2_Dichloroethane	2.6	2.3	10
1,1_Dichloroethylene	2.6	2.5	4
trans_1,2_dichloroethylene	2.4	2.3	4
Dichloromethane	17.1	8.6	37
1,2_Dichloropropane	2.4	2.5	4
1,3_Dichloropropylene	2.5	4.7	4
1,1,2,2_Tetrachloroethane	7.5	7.5	0
1,1,1,2_Tetrachloroethane	4.1	4.2	2
Tetrachloroethylene	7.5	7.5	0
1,1,1-Trichloroethane	3.0	3.0	0
1,1,2-Trichloroethane	4.5	4.7	4
Trichloroethylene	4.0	4.0	0
Trichlorofluormethane	2.3	2.1	9
Trichloropropane	2.0	2.0	0
Vinyl chloride	0.94	0.77	18

8809200
2002
2423
2000
2426
2427
2482
-489
2002

file: 8020CONT
3 Nov 88

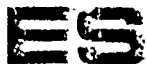
VOLATILE CONTINUING CALIBRATION CHECK

LabName: _____ Contract: _____
Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____
Instrument ID.: CARBONK Calibration Date(s): 9/21/89 _____
LAB FILE ID: 12 Init. Calib. Date(s): 9/10/89 _____

COMPOUND	RRF	RRF50	%D
Benzene	4.9	5.6	14
Chlorobenzene	5.3	5.8	9
1,2_Dichlorobenzene	4.7	4.8	2
1,3_Dichlorobenzene	4.7	5.1	9
1,4_Dichlorobenzene	4.0	4.1	3
Ethyl Benzene	4.0	4.2	5
Toluene	3.9	4.6	18
Xylenes	3	14	8

DATA PACKAGE #58

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**ENGINEERING-SCIENCE, INC.**600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the soil samples received
by this laboratory on 8-27-88.Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88082146	DANGB-3-MW25-SS1,0-1'	AS-F	8-26-88		10-07-88	
88082146	DANGB-3-MW25-SS1,0-1'	BA-I	8-26-88		9-19-88	
88082146	DANGB-3-MW25-SS1,0-1'	CD-F	8-26-88		9-19-88	
88082146	DANGB-3-MW25-SS1,0-1'	CR-F	8-26-88		9-19-88	
88082146	DANGB-3-MW25-SS1,0-1'	HG-C	8-26-88		9-21-88	
88082146	DANGB-3-MW25-SS1,0-1'	PB-F	8-26-88		10-04-88/10-05-88	
88082146	DANGB-3-MW25-SS1,0-1'	418.1	8-26-88	9-21-88	9-22-88	
88082146	DANGB-3-MW25-SS1,0-1'	MOIS	8-26-88		9-02-88	
88082146	DANGB-3-MW25-SS1,0-1'	8010	8-26-88		9-06-88	9-08-88
88082146	DANGB-3-MW25-SS1,0-1'	8020	8-26-88		9-06-88	9-08-88
38082146	DANGB-3-MW25-SS1,0-1'	8080	8-26-88	9-01-88	9-27-88	
88082146	DANGB-3-MW25-SS1,0-1'	8270	8-26-88	10-28-88	11-02-88	

* If applicable

**ENGINEERING-SCIENCE, INC.**600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88082147	DANGB-3-MW25-SS2,2-3	AS-F	8-26-88		10-07-88	
88082147	DANGB-3-MW25-SS2,2-3	BA-I	8-26-88		9-19-88	
88082147	DANGB-3-MW25-SS2,2-3	CD-F	8-26-88		9-19-88	
88082147	DANGB-3-MW25-SS2,2-3	CR-F	8-26-88		9-19-88	
88082147	DANGB-3-MW25-SS2,2-3	HG-C	8-26-88		9-21-88	
88082147	DANGB-3-MW25-SS2,2-3	PB-F	8-26-88		10-04-88/10-05-88	
88082147	DANGB-3-MW25-SS2,2-3	418.1	8-26-88	9-21-88	9-22-88	
88082147	DANGB-3-MW25-SS2,2-3	MOIS	8-26-88		9-02-88	
88082147	DANGB-3-MW25-SS2,2-3	8010	8-26-88		9-06-88	9-08-88
88082147	DANGB-3-MW25-SS2,2-3	8020	8-26-88		9-06-88	9-08-88
88082147	DANGB-3-MW25-SS2,2-3	8080	8-26-88	9-01-88	9-27-88	
88082147	DANGB-3-MW25-SS2,2-3	8270	8-26-88	10-28-88	11-02-88	
88082148	DANGB-3-MW25-SS3,14-15	AS-F	8-26-88		10-07-88	
88082148	DANGB-3-MW25-SS3,14-15	BA-I	8-26-88		9-19-88	
88082148	DANGB-3-MW25-SS3,14-15	CD-F	8-26-88		9-19-88	
88082148	DANGB-3-MW25-SS3,14-15	CR-F	8-26-88		9-19-88	
88082148	DANGB-3-MW25-SS3,14-15	HG-C	8-26-88		9-21-88	
88082148	DANGB-3-MW25-SS3,14-15	PB-F	8-26-88		10-04-88/10-05-88	
88082148	DANGB-3-MW25-SS3,14-15	418.1	8-26-88	9-21-88	9-22-88	
88082148	DANGB-3-MW25-SS3,14-15	MOIS	8-26-88		9-02-88	
88082148	DANGB-3-MW25-SS3,14-15	8010	8-26-88		9-06-88	9-08-88
88082148	DANGB-3-MW25-SS3,14-15	8020	8-26-88		9-06-88	9-08-88
88082148	DANGB-3-MW25-SS3,14-15	8080	8-26-88	9-01-88	9-27-88	
88082148	DANGB-3-MW25-SS3,14-15	8270	8-26-88	10-28-88	11-02-88	

* If applicable

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88082146-88082148
WORK ORDER NO.: 921

These soil samples were received at the ES Berkeley Laboratory on 8-27-88. They were received cold and intact.

Due to a suspected interelement matrix interference, all cadmium data at levels reportable by ICP analysis (>1 mg/KG dry wt.) are potentially false positives. This is being investigated and follow-up will be provided when available.

The original 8270 analysis exceeded the method holding time by one day. The surrogate spike recoveries were out of control. The samples were then re-extracted and rerun and the surrogate spike recoveries were in control.

11/21/88

ANALYSIS REPORT

WORK ORDER NUMBER: 921
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/27/88

APPROVED BY *[Signature]*
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

: OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 2, UNITS: mg/Kg

TEST COMPOUND	DANGB-3-MW25- SS1-0-1' 88082146	DANGB-3-MW25- SS2-2-3' 88082147	DANGB-3-MW25- SS3-14-15' 88082148
ACID DIG SOIL	NA	NA	NA
ARSENIC	<5.0WE	<5.0E	<5.0E
BARIUM	62.5	55.4	41.4
CADMIUM	11.9N	9.7N	11.1N
CHROMIUM	40.7	27.3	34.0
MERCURY	<0.1	<0.1	<0.1
LEAD	3.9*	6.5S*	3.1*

NA - Not Analyzed

ND - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 921
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/27/88

APPROVED BY RWBurston
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 3, UNITS: mg/Kg

TEST COMPOUND	DANGB3, MW25, SS1, 0-1' 88082146	DANGB3, MW25, SS2, 2-3' 88082147	DANGB3, MW25, SS3, 14-15' 88082148
418.1 PETROLEUM HYDROCARBONS	<100	<100	<100
% MOISTURE	11.7	13.4	13.2

ND - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 921
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/27/88

APPROVED BY RWB
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/Kg, GROUP 8010

TEST COMPOUND	DANGB3, MW25, SS1, 0-1' 88082146	DANGB3, MW25, SS2, 2-3' 88082147	DANGB3, MW25, SS3, 14-15' 88082148
BENZYL CHLORIDE	ND	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND	ND
BIS (2-CHLOROISOPROPYL) ETHER	ND	ND	ND
BROMOBENZENE	ND	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND
BROMOFORM	ND	ND	ND
BROMOETHANE	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND
CHLORACETALDEHYDE	ND	ND	ND
CHLORAL	ND	ND	ND
CHLOROBENZENE	ND	ND	ND
CHLOROETHANE	ND	ND	ND
CHLOROFORM	ND	ND	ND
1-CHLOROHEXANE	ND	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND	ND
CHLOROMETHANE	ND	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND	ND
CHLOROTOLUENE	ND	ND	ND
DIBROMOCHLOROMETHANE	ND	ND	ND
DIBROMOMETHANE	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND
1,1-DICHLOROETHYLENE	ND	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND	ND
DICHLOROMETHANE	2.5B	ND	ND
1,2-DICHLOROPROPANE	ND	ND	ND

ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 921

TEST COMPOUND	DANGB3, MW25, SS1, 0-1' 88082146	DANGB3, MW25, SS2, 2-3' 88082147	DANGB3, MW25, SS3, 14-15' 88082148
1,3-DICHLOROPROPYLENE	ND	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND	ND
1,1,1,2-TETRACHLOROETHANE	ND	ND	ND
TETRACHLOROETHYLENE	ND	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND	ND
TRICHLOROETHYLENE	ND	ND	ND 4.4
TRICHLOROFLUOROMETHANE	ND	ND	ND
TRICHLOROPROPANE	ND	ND	ND
VINYL CHLORIDE	ND	ND	ND

ND - Not Detected

11/14/88

ANALYSIS REPORT

WORK ORDER NUMBER: 921
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 08/27/88

APPROVED BY


Lab Supervisor

REPORT DATA:

ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:

ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

: OF REPORT COPIES: 1

CONTRACT / PO # : OR001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4, UNITS: ug/Kg, GROUP 8020

TEST COMPOUND	DANGB3, MW25, SS1, 0-1' 88082146	DANGB3, MW25, SS2, 2-3' 88082147	DANGB3, MW25, SS3, 14-15' 88082148
BENZENE	ND	ND	ND
CHLOROBENZENE	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND
ETHYL BENZENE	ND	ND	ND
TOLUENE	ND	ND	ND
XYLENES	ND	ND	ND

ND - Not Detected

11/14/88

ANALYSIS REPORT

WORK ORDER NUMBER: 921
 JOB NUMBER : ZB0000000440
 WORK ORDER DATE : 08/27/88

APPROVED BY *RWB*
 Lab Supervisor

REPORT DATA:
 ES OAK RIDGE/DULUTH ANGB
 710 S. ILLINOIS AVE. STE. S103
 OAK RIDGE, TN 37830
 BILL HAYDEN

CLIENT DATA:
 ES OAK RIDGE/DULUTH ANGB (134)
 710 S. ILLINOIS AVE. STE. S103
 OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : OR001
 CONTACT : BILL HAYDEN
 (615)-481-3920

TASK: 4, UNITS: ug/Kg, GROUP 8080

TEST COMPOUND	DANGB3, MW25, SS1, 0-1' 88082146	DANGB3, MW25, SS2, 2-3' 88082147	DANGB3, MW25, SS3, 14-15' 88082148
ALDRIN	ND	ND	ND
ALPHA-BHC	ND	ND	ND
BETA-BHC	ND	ND	ND
DELTA-BHC	ND	ND	ND
GAMMA-BHC	ND	ND	ND
CHLORDANE	ND	ND	ND
4,4'-DDD	ND	ND	ND
4,4'-DDE	ND	ND	ND
4,4'-DDT	ND	ND	ND
DIELDRIN	ND	ND	ND
ENDOSULFAN I	ND	ND	ND
ENDOSULFAN II	ND	ND	ND
ENDOSULFAN SULFATE	ND	ND	ND
ENDRIN	ND	ND	ND
ENDRIN ALDEHYDE	NA	NA	NA
HEPTACHLOR	ND	ND	ND
HEPTACHLOR EPOXIDE	ND	ND	ND
KEPONE	NA	NA	NA
METHOXYCHLOR	ND	ND	ND
TOXAPHENE	ND	ND	ND
PCB-1016	ND	ND	ND
PCB-1221	ND	ND	ND
PCB-1232	ND	ND	ND
PCB-1242	ND	ND	ND
PCB-1248	ND	ND	ND
PCB-1254	ND	ND	ND
PCB-1260	ND	ND	ND

ND - Not Detected

NA - Not Analyzed

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

page 1 of 5

Date Received: August 27, 1988
Date Reported: December 8, 1988

Work Order: 921
Job Number: OR001

-OR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082146	88082147
Sample No.:	DANGB3-MW25- SS1- 0-1'	DANGB3-MW25- SS2- 2-3'
Date Sampled:	8-26-88	8-26-88
Time Sampled:	08:16	08:20
Date Extracted:	10-28-88	10-28-88
Date Analyzed:	11-02-88	11-02-88
Percent Moisture:	12	13

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
1,3-Dichlorobenzene	330	ND	ND
1,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Bis(2-chloroethyl)ether	330	ND	ND
1,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Bis(2-chloroisopropyl)ether	330	ND	ND
N-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
Nitrobenzene	330	ND	ND
Isophorone	330	ND	ND
Naphthalene	330	ND	ND
Bis(2-chloroethoxy)methane	330	ND	ND
2-Chloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
Acenaphthylene	330	ND	ND
Acenaphthene	330	ND	ND
Dimethyl phthalate	330	ND	ND
2,6-Dinitrotoluene	330	ND	ND
Fluorene	330	ND	ND
2,4-Dinitrotoluene	330	ND	ND
Diethyl phthalate	330	ND	ND
N-Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

page 2 of 5

Date Received: August 27, 1988
Date Reported: December 8, 1988

Work Order: 921
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082146	88082147
Sample No.:	DANGB3-MW25- SS1- 0-1'	DANGB3-MW25- SS2- 2-3'
Date Sampled:	8-26-88	8-26-88
Time Sampled:	08:16	08:20
Date Extracted:	10-28-88	10-28-88
Date Analyzed:	11-02-88	11-02-88
Percent Moisture:	12	13

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Dibutyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Butyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
4-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benzidine	2000	ND	ND
3,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Page 3 of 5

Date Received: August 27, 1988
Date Reported: December 8, 1988

Work Order: 921
Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082146	88082147
Sample No.:	DANGB3-MW25-	DANGB3-MW25-
	SS1- 0-1'	SS2- 2-3'
Date Sampled:	8-26-88	8-26-88
Time Sampled:	08:16	08:20
Date Extracted:	10-28-88	10-28-88
Date Analyzed:	11-02-88	11-02-88
Percent Moisture:	12	13

Compound	Detection Limits	Analytical Results (dry weight)	
		ug/kg	ug/kg
Acetophenone	--*	ND	ND
Aniline	--*	ND	ND
4-Aminobiphenyl	--*	ND	ND
4-Chloroaniline	660	ND	ND
1-Chloronaphthalene	--*	ND	ND
Dibenzofuran	330	ND	ND
p-Dimethylaminoazobenzene	--*	ND	ND
7,12-Dimethylbenz(a)anthracene	--*	ND	ND
a-,a-Dimethylphenethylamine	--*	ND	ND
Diphenylamine	--*	ND	ND
1,2-Diphenylhydrazine	--*	ND	ND
Ethyl methanesulfonate	--*	ND	ND
3-Methylcholanthrene	--*	ND	ND
Methyl methanesulfonate	--*	ND	ND
2-Methylnaphthalene	330	ND	ND
1-Naphthylamine	--*	ND	ND
2-Naphthylamine	--*	ND	ND
2-Nitroaniline	1600	ND	ND
3-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
N-Nitroso-di-n-butylamine	--*	ND	ND
N-Nitrosopiperidine	--*	ND	ND
Pentachlorobenzene	--*	ND	ND
Pentachloronitrobenzene	--*	ND	ND
Phenacetin	--*	ND	ND
2-Picoline	--*	ND	ND
Pronamide	--*	ND	ND
1,2,4,5-Tetrachlorobenzene	--*	ND	ND

3022

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

page 4 of 5

Date Received: August 27, 1988
Date Reported: December 8, 1988

Work Order: 921
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN:Mr. Bill Hayden

Lab Number:	98082146	88082147
Sample No.:	DANGB3-MW25-	DANGB3-MW25-
	SS1- 0-1'	SS2- 2-3'
Date Sampled:	8-26-88	8-26-88
Time Sampled:	08:16	08:20
Date Extracted:	10-28-88	10-28-88
Date Analyzed:	11-02-88	11-02-88
Percent Moisture:	12	13

Compound	Detection	ANALYTICAL RESULTS	
	Limits ug/kg	ug/kg	ug/kg
Alpha-BHC	--x	ND	ND
Gamma-BHC	--x	ND	ND
Beta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Aldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	--x	ND	ND
Dieldrin	500	ND	ND
4,4'-DDE	1000	ND	ND
Endrin	--x	ND	ND
Endosulfan II	--x	ND	ND
4,4'-DDD	500	ND	ND
4,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	--x	ND	ND
Endrin Ketone	--x	ND	ND
Chlordane	2000	ND	ND
Methoxychlor	--x	ND	ND
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1248	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

3023

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

page 5 of 5

Date Received: August 27, 1988
Date Reported: December 8, 1988

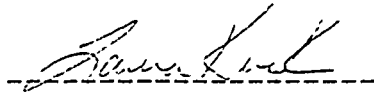
Work Order: 921
Job Number: OR001

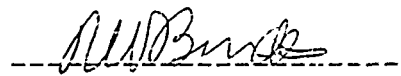
FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082146	88082147
Sample No.:	DANGB3-MW25-	DANGB3-MW25-
	SS1- 0-1'	SS2- 2-3'
Date Sampled:	8-26-88	8-26-88
Time Sampled:	08:16	08:20
Date Extracted:	10-28-88	10-28-88
Date Analyzed:	11-02-88	11-02-88
Percent Moisture:	12	13

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS	
		(dry weight) ug/kg	ug/kg
2-Chlorophenol	330	ND	ND
2-Nitrophenol	330	ND	ND
Phenol	330	ND	ND
2,4-Dimethylphenol	330	ND	ND
2,4-Dichlorophenol	330	ND	ND
2,4,6-Trichlorophenol	330	ND	ND
4-Chloro-3-methylphenol	660	ND	ND
2,4-Dinitrophenol	1600	ND	ND
2,6-Dichlorophenol	--*	ND	ND
2-Methyl-4,6-Dinitrophenol	1600	ND	ND
Pentachlorophenol	1600	ND	ND
4-Nitrophenol	1600	ND	ND
Benzoic Acid	1600	ND	ND
2-Methylphenol	330	ND	ND
3- & 4-Methylphenol	330	ND	ND
2,3,4,6-Tetrachlorophenol	--*	ND	ND
2,4,5-Trichlorophenol	330	ND	ND


Analyst


Laboratory Supervisor

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

3024

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

page 1 of 5

Date Received: August 27, 1988
Date Reported: December 8, 1988

Work Order: 921
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number: 88082148
Sample No.: DANGB3-MW25-
SS3- 14-15'
Date Sampled: 8-26-88
Time Sampled: 08:52
Date Extracted: 10-28-88
Date Analyzed: 11-02-88
Percent Moisture: 13

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg
1,3-Dichlorobenzene	330	ND
1,4-Dichlorobenzene	330	ND
Hexachloroethane	330	ND
Bis(2-chloroethyl)ether	330	ND
1,2-Dichlorobenzene	330	ND
N-Nitrosodimethylamine	330	ND
Bis(2-chloroisopropyl)ether	330	ND
N-Nitrosodi-n-propylamine	330	ND
Hexachlorobutadiene	330	ND
1,2,4-Trichlorobenzene	330	ND
Nitrobenzene	330	ND
Isophorone	330	ND
Naphthalene	330	ND
Bis(2-chloroethoxy)methane	330	ND
2-Chloronaphthalene	330	ND
Hexachlorocyclopentadiene	330	ND
Acenaphthylene	330	ND
Acenaphthene	330	ND
Dimethyl phthalate	330	ND
2,6-Dinitrotoluene	330	ND
Fluorene	330	ND
2,4-Dinitrotoluene	330	ND
Diethyl phthalate	330	ND
N-Nitrosodiphenylamine	330	ND
Hexachlorobenzene	330	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

page 2 of 5

Date Received: August 27, 1988
Date Reported: December 8, 1988

Work Order: 921
Job Number: OR001

OR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number: 88082148
Sample No.: DANGB3-MW25-
SS3- 14-15'
Date Sampled: 8-26-88
Time Sampled: 08:52
Date Extracted: 10-28-88
Date Analyzed: 11-02-88
Percent Moisture: 13

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight) ug/kg
Phenanthrene	330	ND
Anthracene	330	ND
Dibutyl phthalate	330	ND
Fluoranthene	330	ND
4-Chlorophenyl phenyl ether	330	ND
Pyrene	330	ND
Butyl Benzyl phthalate	330	ND
Bis(2-ethylhexyl) phthalate	330	530
Chrysene	330	ND
4-Bromophenyl phenyl ether	330	ND
Benzo(a)anthracene	330	ND
Di-n-octylphthalate	330	ND
Benzo(b)fluoranthene	330	ND
Benzo(k)fluoranthene	330	ND
Ben-zidine	2000	ND
3,3'-Dichlorobenzidine	660	ND
Benzo(a)pyrene	330	ND
Indeno(1,2,3-cd)pyrene	330	ND
Dibenzo(a,h)anthracene	330	ND
Benzo(ghi)perylene	330	ND
Benzyl Alcohol	660	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Page 3 of 5

Date Received: August 27, 1988
Date Reported: December 8, 1988

Work Order: 921
Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number: 88082148
Sample No.: DANGB3-MW25-
SS3- 14-15'
Date Sampled: 8-26-88
Time Sampled: 08:52
Date Extracted: 10-28-88
Date Analyzed: 11-02-88
Percent Moisture: 13

Compound	Detection Limits ug/kg	Analytical Results (dry weight) ug/kg
Acetophenone	---	ND
Aniline	---	ND
4-Aminobiphenyl	---	ND
4-Chloroaniline	660	ND
1-Chloronaphthalene	---	ND
Dibenzofuran	330	ND
p-Dimethylaminoazobenzene	---	ND
7,12-Dimethylbenz(a)anthracene	---	ND
a-,a-Dimethylphenethylamine	---	ND
Diphenylamine	---	ND
1,2-Diphenylhydrazine	---	ND
Ethyl methanesulfonate	---	ND
3-Methylcholanthrene	---	ND
Methyl methanesulfonate	---	ND
2-Methylnaphthalene	330	ND
1-Naphthylamine	---	ND
2-Naphthylamine	---	ND
2-Nitroaniline	1600	ND
3-Nitroaniline	1600	ND
4-Nitroaniline	1600	ND
N-Nitroso-di-n-butylamine	---	ND
N-Nitrosopiperidine	---	ND
Pentachlorobenzene	---	ND
Pentachloronitrobenzene	---	ND
Phenacetin	---	ND
2-Picoline	---	ND
Pronamide	---	ND
1,2,4,5-Tetrachlorobenzene	---	ND

3027

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

page 4 of 5

Date Received: August 27, 1988
Date Reported: December 8, 1988

Work Order: 921
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN:Mr. Bill Hayden

Lab Number: 88082148
Sample No.: DANGB3-MW25-
SS3- 14-15'
Date Sampled: 8-26-88
Time Sampled: 08:52
Date Extracted: 10-28-88
Date Analyzed: 11-02-88
Percent Moisture: 13

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS
		(dry weight) ug/kg
Alpha-BHC	--*	ND
Gamma-BHC	--*	ND
Beta-BHC	660	ND
Heptachlor	330	ND
Delta-BHC	500	ND
Aldrin	330	ND
Heptachlor epoxide	330	ND
Endosulfan I	--*	ND
Dieldrin	500	ND
4,4'-DDE	1000	ND
Endrin	--*	ND
Endosulfan II	--*	ND
4,4'-DDD	500	ND
4,4'-DDT	830	ND
Endosulfan Sulfate	1000	ND
Endrin aldehyde	--*	ND
Endrin Ketone	--*	ND
Chlordane	2000	ND
Methoxychlor	--*	ND
Toxaphene	2000	ND
Aroclor-1016	2000	ND
Aroclor-1221	2000	ND
Aroclor-1232	2000	ND
Aroclor-1242	2000	ND
Aroclor-1248	2000	ND
Aroclor-1254	2000	ND
Aroclor-1260	2000	ND

3028

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

page 5 of 5

Date Received: August 27, 1988
Date Reported: December 8, 1988


Work Order: 921
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number: 88082148
Sample No.: DANGE3-MW25-
SS3- 14-15'
Date Sampled: 8-26-88
Time Sampled: 08:52
Date Extracted: 10-28-88
Date Analyzed: 11-02-88
Percent Moisture: 13

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS	
		(dry weight) ug/kg	ug/kg
2-Chlorophenol	330	ND	
2-Nitrophenol	330	ND	
Phenol	330	ND	
2,4-Dimethylphenol	330	ND	
2,4-Dichlorophenol	330	ND	
2,4,6-Trichlorophenol	330	ND	
4-Chloro-3-methylphenol	660	ND	
2,4-Dinitrophenol	1600	ND	
2,6-Dichlorophenol	--*	ND	
2-Methyl-4,6-Dinitrophenol	1600	ND	
Pentachlorophenol	1600	ND	
4-Nitrophenol	1600	ND	
Benzoic Acid	1600	ND	
2-Methylphenol	330	ND	
3- & 4-Methylphenol	330	ND	
2,3,4,6-Tetrachlorophenol	--*	ND	
2,4,5-Trichlorophenol	330	ND	


Analyst


Laboratory Supervisor

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

3029

ENGINEERING-SCIENCE

CHAIN OF CUSTODY RECORD 921

ES JOB NO. OR001	PROJECT NAME/LOCATION Duluth ANGB/Duluth, Mn.	NO. OF CONTAINERS	SAMPLE DESCRIPTION	SOILS ANALYSES REQUIRED					SHIP TO: ENGINEERING-SCIENCE LABORATORY, INC. 600 Bancroft Way Berkeley, CA. 94710 9/26/88
				SW 8010, 8020	SW 8080	EPA 418.1	SW 6010, 7060	SW 7131, 7421, 7471	
8/26/88 0816	DANGB, 3 MW 25, 551, 0-1'	1		X					Arsenic - SW 7060, 582146
8/26/88 0816	DANGB, 3 MW 25, 551, 0-1'	1		X					Barium - SW 6010
8/26/88 0816	DANGB, 3 MW 25, 552, 2-3'	1		X					Cadmium - SW 7131, 582147
8/26/88 0820	DANGB, 3 MW 25, 552, 2-3'	1		X					Chromium - SW 7191
8/26/88 0852	DANGB, 3 MW 25, 553, 14-15'	1		X					Lead - SW 7421, 582148
8/26/88 0852	DANGB, 3 MW 25, 553, 14-15'	1		X					Mercury - SW 7471
3030									
Relinquished by: (Signature) <i>[Signature]</i>				Received by: (Signature)		Date/Time 8/26/88 1800		Relinquished by: (Signature)	
Relinquished by: (Signature) <i>[Signature]</i>				Received for Laboratory by: (Signature) <i>[Signature]</i>		Date/Time 8/27/88 12:00		Remarks rec'd cold & intact	

QUALITY CONTROL RESULTS SUMMARY METALS

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, In. 37830

QC Report No: AAF-S-0028-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-26-88
Date Reported: 10-13-88
Dilution Factor: See Notes
%Moisture: 7.8

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88082131-88082133, 88082043-88082049
88082100-88082104, 88082146-88082148

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	C1	Duplicate C2	RPD	SA	Spike Recovery SR	SSR	PR	Notes
Arsenic	88082133	88082133	10-06-88	9-23-88	7060	<0.5	<5.0E	<5.0E	NC	4.34	2.71E	4.99E	53N	DF=10
Lead	88082133	88082133	10-04-88	9-23-88	7421	<0.5	2.82	3.53	22*	5.42	2.82	8.59	106	DF=11A

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

* See Case Narrative attached.
E See Legend attached.
N See Legend attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$ C1 = Concentration One C2 = Concentration Two
NA = Not Applicable
NC = Not Calculated
ND = Not Detected

Percent Recovery (F.) = $\frac{SSR - SR}{SA} \times 100$ SSR = Spiked Sample Result SR = Sample Result SA = Spike Added (Concentration)

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88082043-88082049, 88082100
SAMPLE NO(S).: 88082102, 88082104
SAMPLE NO(S).: 88082130-88082133
SAMPLE NO(S).: 88082146-88082148

As a result of extreme sample matrix interference, dilution was required for sample analysis. The reporting limit and MDL for the analyte(s) listed have increased as shown.

<u>Analyte</u>	<u>Reporting Limit</u>	<u>MDL</u>
Arsenic	10 mg/Kg	5.0 mg/Kg

QUALITY CONTROL RESULTS SUMMARY METALS

Job No.: OR001
 Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830

QC Report No: ICP-S-0028-88
 Sample Matrix: Soil
 Conc. Unit: mg/KG
 Date Received: 8-26-88
 Date Reported: 10-13-88
 Dilution Factor: NA
 %Moisture: 7.8

Project: Duluth ANGB
 Laboratory Supervisor Approval: *[Signature]*

QC Report for Laboratory Sample No(s):
 88082133, 88082099-88082104
 88082146-88082148, 88082130-88082132

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	C1	Duplicate C2	RPD	SA	Spike Recovery SR	SSR	PR	Notes
Barium	88082133	88082133	9-10-88	9-15-88	6010	<20	43.7	43.9	<1	217	43.7	275	107	
Cadmium	88082133	88082133	9-10-88	9-15-88	6010	<0.5	10.7	10.7	0	5.42	10.7	13.9	59N	A
Chromium	88082133	88082133	9-10-88	9-15-88	6010	<1.0	27.3	30.4	11	21.7	27.3	50.3	106	

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
 N See Legend attached.
 A See Case Narrative attached.

Relative Percent Difference (RPD) = $\frac{C1 - C2}{(C1 + C2)/2} \times 100$
 C1 = Concentration One
 C2 = Concentration Two
 NA = Not Applicable
 NC = Not Calculated
 ND = Not Detected

Percent Recovery (PR) = $\frac{SSR - SR \times 100}{SA}$
 SSR = Spiked Sample Result
 SR = Sample Result
 SA = Spike Added (Concentration)

CASE NARRATIVE

QUALITY CONTROL RESULTS SUMMARY

SAMPLE NO(S).: 88081969-88081976, 88082043-88082049

SAMPLE NO(S).: 88082099-88082101, 88082102-88082104

SAMPLE NO(S).: 88082130-88082133, 88082146-88082148

QC REPORT NO.: ICP-S-0028-88

QC REPORT NO.: ICP-S-0031-88

Due to a suspected interelement matrix interference, all cadmium data at levels reportable by ICP analysis (≥ 1 mg/KG dry weight) are potentially false positives. This is being investigated and follow-up will be provided when available.

METALS

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois
Suite F-103
Oak Ridge, TN

QC Report No:	CVM-S-0014-88
Sample Matrix:	Soil
Conc. Unit:	mg/KG
Date Received:	8-26-88
Date Reported:	10-13-88
Dilution Factor:	NA
%Moisture:	8.4

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88082130-88082133, 88082146-88082152
88082156-88082163

Analyte	Laboratory Duplicates	Sample Nos. Spike	Date Anal	Date Prep	Anal Method	Blank	C1	Duplicate C2	RPD	SA	Spike Recovery SR	SSR	PR	Notes
Mercury	88082130	88082130	9-21-88	9-21-88	7471	<0.1	<0.1	<0.1	NC	1.09	<0.1	1.14	105	

3035

Relative Percent Difference (RPD)	$= \frac{C1 - C2}{(C1 + C2)/2}$	X 100	C1 = Concentration One	C2 = Concentration Two	NA = Not Applicable	NC = Not Calculated

$$\text{Percent Recovery (PR)} = \frac{\text{SSR} - \text{SR} \times 100}{\text{SA}}$$

SSR = Spiked Sample Result
 SR = Sample Result
 SA = Spike Added (Concentration)

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
Samples No.: 88081959-88081977
Samples No.: 88082043-88082049
Samples No.: 88082099-88082104
Samples No.: 88082130-88082133
Samples No.: 88082146-88082148

The results obtained for the laboratory control sample (LCS) analyzed with these samples for the analyte Mercury exceeded the recommended EPA recoveries. All data associated with this batch was closely inspected and no analytical problems were found. The initial and continuing calibration verification standards and blanks and precision and accuracy recoveries were within acceptable limits. The Mercury LCS was prepared at a concentration exceeding the linear range of the test.

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001 QC Report No: TPH-S-0055-88
Client: ES Oak Ridge Sample Matrix: Soil
Attn: Bill Hayden Conc. Unit: mg/KG
Address: 710 S. Illinois Avenue Date Received: 8-26-88
Suite F-103 Date Prepared: 9-19-88
Oak Ridge, Tn. 37830 Date Analyzed: 9-20-88
Date Reported: 9-27-88
Dilution Factor: 6
Moisture: 7.5

Project: Duluth ANGB Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88082130-88082133, 88082146-88082151
88082156-88082163

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88082132	418.1	<100	130	1100	710	65	770	70	8	*

3037

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* Percent recovery and relative percent difference are within ES Laboratory control limits.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$ MS = Spike Sample NA = Not Applicable
MSD = Spike Duplicate NC = Not Calculated

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$ SR = Sample Result ND = Not Detected
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-1103
Oak Ridge, Tn. 37830

QC Report No: VGC-S-0040-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 9-02-88
Date Prepared: NA
Date Analyzed: 9-09-88
Date Reported: 10-06-88
Dilution Factor: NA
% Moisture: 34.6

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88082146-88082148
88082156-88082163

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
88082158	Halocarbons: 8010									
	1,1-dichloroethane	15.3	ND	18.7	122	17.3	113	8	20	58-124
	Trichloroethene	15.3	ND	12.6	82	11.3	74*	11	16	75-110
	Chlorobenzene	15.3	ND	12.8	84	11.6	76	10	21	71-125
88082158	Aromatics: 8020									
	Benzene	15.3	ND	13.2	86	11.7	76	12	26	75-123
	Toluene	15.3	ND	13.2	86	12.0	78*	10	16	79-115
	Chlorobenzene	15.3	ND	12.8	84	11.7	76*	9	24	82-112

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

* Asterisked values are outside of laboratory QC limits. Analysis of spiked blanks shows the laboratory to be in control.

Relative Percent Difference (PR) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SA}{SA} \times 100$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88082146-88082148
88082156-88082163

QC Report No: VGC-S-0040-88B
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: NA
Date Prepared: NA
Date Analyzed: 9-09-88
Date Reported: 10-06-88
Dilution Factor: NA
% Moisture: NA

Laboratory Supervisor Approval:

[Signature]

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits % Recovery
3029	Halocarbons: 8010									
	1,1-dichloroethane	10	ND	10.7	107	9.2	92	15	20	58-124
	Trichloroethene	10	ND	10.0	100	10.0	100	0	16	75-110
	Chlorobenzene	10	ND	9.5	95	10.6	106	11	21	71-125
Blank	Aromatics: 8020									
	Benzene	10	ND	10.2	102	9.7	97	5	26	75-123
	Toluene	10	ND	10.2	102	9.7	97	5	16	79-115
	Chlorobenzene	10	ND	10.1	101	9.9	99	2	24	82-112

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

$$\text{Relative Percent Difference (PR)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(\text{MS or MSD}) - \text{SR}}{\text{SA}} \times 100$$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)
NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No:

OR001

Client:

ES Oak Ridge

Attn:

Bill Hayden

Address:

710 S. Illinois Avenue

Suite F-103

Oak Ridge, Tn. 37830

Sample Matrix:

Soil

Conc. Unit:

ug/KG

Date Reported:

10-06-88

Project:

Duluth ANGB

Laboratory Supervisor Approval:

[Signature]

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
59	9-06-88	VGC	Carbopack	75-09-2 67-66-3	Dichloromethane Chloroform	1.7 0.2	0.5 0.05	88082146-88082149
3040								

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY

QC REPORT NO.: VGC-S-0040-88
QC REPORT NO.: VGC-S-0040-88B

The quality control sample for this batch is from a different Martin Marietta project. Asterisked values are outside ES Laboratory QC limits. Analysis of six blanks showed the laboratory to be in control.

**PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL**

Job No: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No.: OCP-S-0030-88
QC Sample No.: 88082104
Level (Low/Med): Low
Date Reported: 11-10-88

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88082102-88082104
88082130-88082133
88082146-88082148

Bill Hayden

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2190	ND	103	141*	46-127
Heptachlor	2190	ND	109	150*	35-130
Aldrin	2190	ND	118	162*	34-132
Dieldrin	5460	ND	320	176*	31-134
Endrin	5460	ND	286	157*	42-139
4,4'-DDT	5460	ND	299	164*	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits RPD REC
Lindane	77.3	106	141*	29	50 46-127
Heptachlor	84.4	116	150*	25	31 35-130
Aldrin	99.1	136*	162*	17	43 34-132
Dieldrin	256	141*	176*	22	38 31-134
Enarin	225	124	157*	24	45 42-139
4,4'-DDT	219	120	164*	31	50 23-134

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: 0 out of 6 outside limits

Spike Recovery: 8 out of 12 outside limits

PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
SOIL

Job No: 0R001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No.: QCP-S-0030-88B
QC Sample No.: Blank
Level (Low/Med): Low
Date Reported: 11-10-88

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s).:
88082102-88082104
88082130-88082133
88082146-88082148

[Signature]

Compound	Amount Added (ng)	Sample Conc. In Extract (ug/Kg)	MS Conc. In Extract (ug/Kg)	MS % Rec. #	QC Limits Rec.
Lindane	2060	ND	63.0	95	46-127
Heptachlor	2000	ND	67.8	102	35-130
Aldrin	2000	ND	78.6	118	34-132
Dieldrin	5000	ND	190	114	31-134
Endrin	5000	ND	149	89	42-139
4,4'-DDT	5000	ND	187	112	23-134

	MSD Conc. In Extract (ug/Kg)	MSD % Rec. #	MS % Rec. #	% RPD #	QC Limits	
					RPD	REC
Lindane	43.5	65	95	37	50	46-127
Heptachlor	58.3	87	102	15	31	35-130
Aldrin	64.9	97	118	19	43	34-132
Dieldrin	171	103	114	11	38	31-134
Endrin	149	89	89	0	45	42-139
4,4'-DDT	154	92	112	19	50	23-134

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: 0 out of 6 outside limits

Spike Recovery: 0 out of 12 outside limits

PESTICIDE METHOD BLANK SUMMARY

Job No.: OR001 Lab Name: Engineering Science
 Client: ES Oak Ridge Lab Sample No.: Blank
 Attn: Bill Hayden Matrix: Soil
 Address: 710 S. Illinois Avenue Level (low/med): Low
 Suite F-103 Extraction:
 Oak Ridge, Tn. 37830 (SepF/Cont/Sonc): Sonc
 Date Reported: 11-11-88

Project: Duluth ANGB

Date Extracted: 9-01-88
 Date Analyzed (1): 9-27-88 Date Analyzed (2):
 Time Analyzed (1): 10:21 Time Analyzed (2):
 Instrument ID (1): 5890 #2 Instrument ID (2):
 GC Column ID (1): OV-1 GC Column ID (2):

This Method Blank applies to the following samples, MS and MSD.

EPA Sample No.	Lab Sample ID (1)	Date Analyzed 1	Lab Sample ID (2)	Date Analyzed 2
-	88082102	9-27-88		
-	88082103	9-27-88		
-	88082104	9-27-88		
-	88082130	9-27-88		
-	88082131	9-27-88		
-	88082132	9-27-88		
-	88082133	9-27-88		
-	88082146	9-27-88		
-	88082147	9-27-88		
-	88082148	9-27-88		

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO.: OCP-S-0030-88
QC REPORT NO.: OCP-S-0030-88B

Percent recovery for some of the matrix spike and duplicate exceed EPA QC guidelines. Analysis of spiked blanks shows the laboratory to be in control.

Endrin aldehyde and Kepone were not recoverable because they were removed by the alumina column clean-up used on these samples.

Heptachor epoxide was accidentally substituted for Heptachlor in the matrix spiking solution.

QUALITY CONTROL RESULTS SUMMARY
EPA METHOD 8270

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: BNA-S-0045-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 8-18-88
Date Prepared: 10-28-88
Date Analyzed: 11-02-88
Date Reported: 12-08-88
Dilution Factor: NA
%Moisture: 8

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88081887Re, 88081889, 88081939Re,
88081941Re-88081942Re, 88081955Re-88081956
88092146-88092147Re, 88081879, 88081693Re-88081694Re

Fraction	Compound	SA	SR	MS	PR	MSD	PR	RPD	EPA QC Limit RPD %Recovery
3046 B/N Laboratory Sample # 88081942Re	1,2,4-Trichlorobenzene	4060	ND	2370	58	2840	70	18	23 38-107
	Acenaphthene	4060	ND	3660	90	3980	98	8	19 31-137
	2,4-Dinitrotoluene	4060	ND	5040	124*	5980	147*	17	47 28-89
	Pyrene	4060	ND	4880	120	5370	132	10	36 35-142
	N-Nitroso-di-n-Propylamine	4060	ND	5410	133*	5930	146*	9	38 41-126
	1,4-Dichlorobenzene	4060	ND	1460	36	1580	39	8	27 28-104
ACID Laboratory Sample # 88081942Re	Pentachlorophenol	8130	ND	10600	130*	11300	139*	6	47 17-109
	Phenol	8130	ND	6140	76	6910	85	12	35 26-90
	2-Chlorophenol	8130	ND	5840	72	6580	81	12	50 25-102
	4-Chloro-3-Methylphenol	8130	ND	10400	128*	11800	145*	13	33 26-103
	4-Nitrophenol	8130	ND	7320	90	5120	63	35	50 11-114

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* See Case Narrative attached.

$$\text{Relative Percent Difference (RPD)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(\text{MS or MSD}) - \text{SR}}{\text{SA}} \times 100$$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
EPA METHOD 8270

Job No.: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: BNA-S-0045-88B
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: NA
Date Prepared: 10-28-88
Date Analyzed: 11-02-88
Date Reported: 12-08-88
Dilution Factor: NA
%Moisture: NA

Project: Duluth ANGB
Laboratory Supervisor Approval: *[Signature]*

QC Report for Laboratory Sample No(s):
88081887Re, 88081889, 88081939Re, 88081941Re
88081942Re, 88091955Re-88091956, 88092146
88092147Re, 88092148, 88081879, 88081693Re-88081694Re

3047

Fraction	Compound	SA	SR	MS	PR	MSD	PR	RPD	EPA QC Limit RPD %Recovery
B/N Laboratory Sample # Blank	1,2,4-Trichlorobenzene	3330	ND	2600	78	2300	69	12	23 38-107
	Acenaphthene	3330	ND	2630	79	2200	66	18	19 31-137
	2,4-Dinitrotoluene	3330	ND	2870	86	2900	87	1	47 28-89
	Pyrene	3330	ND	3130	94	2930	88	7	36 35-142
	N-Nitroso-di-n-Propylamine	3330	ND	3430	103	2830	85	19	38 41-126
	1,4-Dichlorobenzene	3330	ND	2130	64	1800	54	17	27 28-104
ACID Laboratory Sample # Blank	Pentachlorophenol	6670	ND	6520	98	6070	91	7	47 17-109
	Phenol	6670	ND	3870	58	3240	48	18	35 26-90
	2-Chlorophenol	6670	ND	4200	63	3800	57	10	50 25-102
	4-Chloro-3-Methylphenol	6670	ND	6100	91	6170	92	1	33 26-103
	4-Nitrophenol	6670	ND	1590	24	.990	15	46	50 11-114

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$
Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88082146-88082148
QC REPORT NO.: BNA-S-0045-88
QC REPORT NO.: BNA-S-0045-88B
WORK ORDER NO.: 921

The extracts of these samples were first analyzed one day out of holding time. There were two or more surrogate spikes for each sample that did not meet EPA QC limits. The samples were re-extracted out of holding time. Analysis showed good recoveries of surrogate spikes. The only target compound found was a small amount of bis(2ethylhexyl)phthalate in sample 88082148. Results of the second analysis of each sample are presented in this report.

Analysis of matrix spikes associated with the first extraction of these samples resulted in recoveries and RPD's for many of the spiked compounds that were outside EPA QC limits. Spiked blanks were analyzed with similar results. The data associated with these analyses were closely examined; no errors or problems were found.

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830

Sample Matrix: Soil
 Conc. Unit: ug/KG
 Date Reported: 12-12-88

Laboratory Supervisor Approval:

Project: Duluth ANGB

[Signature]

File ID	Date Analyzed	Fraction	Instru- ment ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
S0564 3049	11-21-88	BNA	1	-	None Detected	-	-	88081939Re 88081941Re, 88081942Re 88081955-88081956 88081887, 88081889 88092146Re-88092148Re

418.1 INITIAL & CONTINUING CALIBRATION DATA

Job No.: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Calibration Date: 9-22-88
Instrument I.D.: Perkin Elmer 257
Grating Infrared Spectrophotometer

Unit: mg/L
Date Reported: 11-09-88
R= 0.9982

Project: Duluth ANGB

Laboratory Supervisor Approval:

Laboratory Sample No(s):
88082146-88082151
88082156-88082163



Standard	Concentration	Absorbance	/Continuous RF /Calibration /Verification
No. 1	0.59	0.105	RF = 6.63
No. 2	1.2	0.187	
No. 3	1.8	0.274	
No. 4	2.4	0.378	
Cont. Cal. No. 2 (88082146-88082151) (88082156-88082159)	1.04	0.184	87%
Cont. Cal. No. 2 (88082160-88082163)	1.04	0.189	87%

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: TPH-S-0055-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 8-26-88
Date Prepared: 9-19-88
Date Analyzed: 9-20-88
Date Reported: 9-27-88
Dilution Factor: 6
%Moisture: 7.5

Project: Duluth ANGB
Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88082130-88082133, 88082146-88082151
88082156-88082163

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88082132	418.1	<100	130	1100	710	65	770	70	8	*

3051

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* Percent recovery and relative percent difference are within ES Laboratory control limits.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$
MS = Spike Sample
MSD = Spike Duplicate
NA = Not Applicable
NC = Not Calculated
ND = Not Detected

Percent Recovery (PR) = $\frac{SR - SR}{SA} \times 100$
SR = Sample Result
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.:

OR001

Client:

ES Oak Ridge

Attn:

Bill Hayden

Address:

710 S. Illinois Avenue

Suite F-103

Oak Ridge, Tn. 37830

Project:

Duluth ANGB

QC Report for Laboratory Sample No(s):

88082130-88082133, 88082146-88082151

88082156-88082163

QC Report No:

TPH-S-0055-88B

Sample Matrix:

Soil

Conc. Unit:

mg/KG

Date Received:

NA

Date Prepared:

9-19-88

Date Analyzed:

9-20-88

Date Reported:

11-15-88

Dilution Factor:

NA

%Moisture:

NA

Laboratory Supervisor Approval:

[Signature]

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
Blank	418.1	<100	<100	1000	860	86	760	76	12	
3052										

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

SR = Sample Result
SA = Spike Added (Concentration)

GC/MS TUNING AND MASS CALIBRATION

Decafluorotriphenylphosphine (DFTFP)

Case No. 123456

Contractor Engineering Scien Contract No. 99999999

Instrument ID #1

Date / Time 10/13/88

Don't seal tank
5:35

Lab ID 11013::02

Data Release Authorized By:

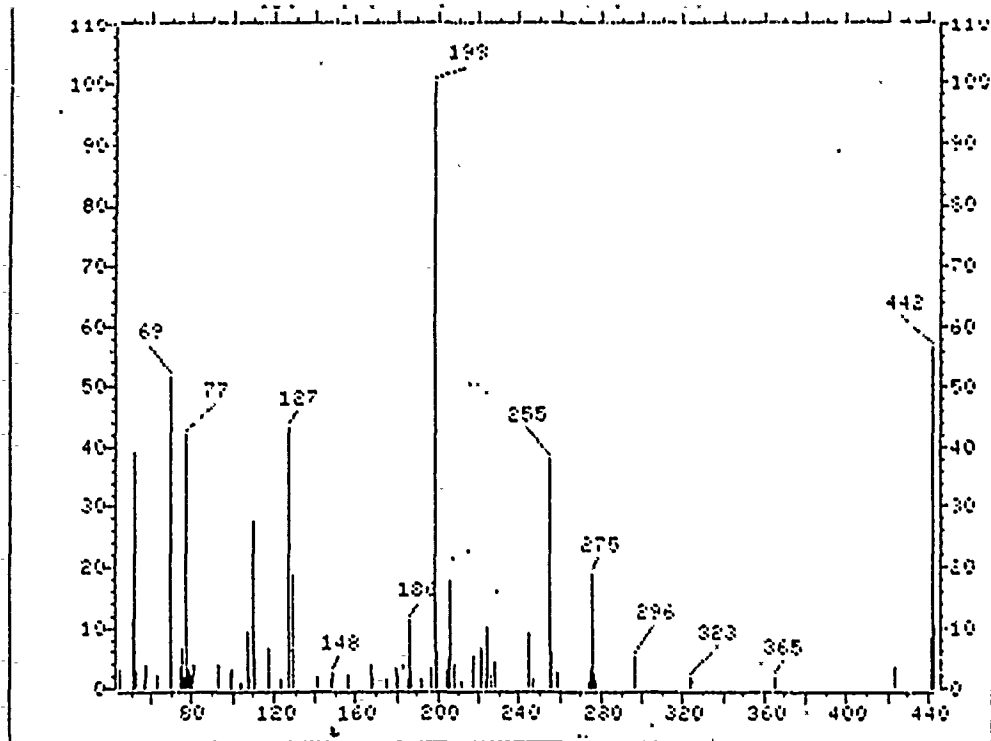
Don Dyer

m/z	ION ABUNDANCE CRITERIA	%RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	39.03 OK
68	less than 2.0% of mass 69	0.00 OK (0.00) #1
69	mass 69 relative abundance	51.49
70	less than 2.0% of mass 69	0.00 OK (0.00) #1
127	40.0 - 60.0% of mass 198	43.10 OK
197	less than 1.0% of mass 198	0.00 OK
198	base peak, 100% relative abundance	100.00 OK
199	5.0 - 9.0% of mass 198	5.68 OK
275	10.0 - 30.0% of mass 198	18.74 OK
365	greater than 1.00% of mass 190	1.94 OK
441	present, but less than mass 443	8.13 OK
442	greater than 40.0% of mass 199	56.52 OK
443	17.0 - 23.0% of mass 442	10.28 OK (18.19) #2

Spot
10/12/88THIS PERFORMANCE TUNE APPLIES TO THE
FOLLOWING SAMPLES, BLANKS AND STANDARDS.#1 - Value in parenthesis is X mass 69.
#2 - Value in parenthesis is X mass 442.

SAMPLE ID	LAB ID	DATE OF ANALYSIS	TIME OF ANALYSIS
SSTD 060	50155	10/13/88	9:55
88082146	50156		11:18
88082147	50157		12:18
88082148	50158		13:18
88082180 BN	50159		14:25
88081982 AC	50160		15:29
88082122 AC	50161		16:29
88082056 AC	50162		17:29
88081981 BN	50163		18:29
88081983 BN	50164 (DL4:1)		19:27
88082189 AC	50165		20:26

another
project



File: >11013 Scan 1: 90 Retn. time: 5.09

m/z	Int.	m/z	Int.	m/z	Int.	m/z	Int.	m/z	Int.
44.10	3.139	91.00	3.985	140.95	1.953	199.10	5.678	255.10	37.666
50.10	11.327	93.10	3.915	147.15	1.345	204.10	2.720	256.10	5.899
51.10	39.032	98.10	2.660	148.05	2.481	205.10	4.812	258.10	2.361
52.10	2.690	99.10	3.078	156.15	2.062	206.10	17.633	273.10	1.106
56.10	1.405	103.00	.867	167.15	3.736	207.20	3.736	274.15	3.078
57.00	3.705	104.00	.867	167.95	1.763	208.10	1.195	275.15	18.739
63.10	2.032	107.10	9.295	175.05	1.285	211.10	1.136	276.15	2.540
69.10	51.494	108.10	1.793	179.05	2.989	217.00	5.051	277.05	1.345
74.10	3.497	110.00	27.316	180.05	2.122	221.10	6.426	296.15	5.140
75.10	6.455	111.10	4.951	185.05	1.404	223.10	1.195	323.15	1.733
76.20	1.763	117.00	6.396	186.05	11.088	224.10	9.952	365.10	1.943
77.10	41.961	123.15	1.375	187.05	2.893	225.10	2.241	423.10	3.467
78.20	3.108	127.15	43.096	192.05	1.315	227.10	4.124	441.25	8.129
79.10	2.959	128.15	3.736	196.10	3.168	244.10	8.876	442.15	56.515
80.00	2.062	129.05	18.769	198.10	100.000	246.00	1.554	443.25	10.281

Continuing Calibration Check
HSL Compounds

Case No: _____ Calibration Date: 10/13/88
Contractor: ENGINEERING - SCIENCE Time: 06:05
Contract No: _____ Laboratory ID: >S0155
Instrument ID: 1 Initial Calibration Date: 10. ¹²/₂₇88
_____ RED

Minimum RF for SPCC is

Maximum % Diff for CCC is %

Compound	RF	RF	%Diff	CCC	SPCC
N-Nitroso-Dimethylamine	.90169	.93881	4.12		
2-Fluorophenol	1.15802	1.22425	5.72		
bis(2-Chloroethyl)ether	1.11892	1.14351	2.20		
Phenol	1.41657	1.56895	10.76	*	
Phenol-d5	1.22488	1.22828	.28		
Aniline	.54193	1.34709	148.57		
2-Chlorophenol	1.23175	1.28808	4.57		
1,3-Dichlorobenzene	1.47535	1.44848	1.82		
1,4-Dichlorobenzene	1.40530	1.38794	1.23	*	
Benzyl Chloride	-	-	-		
Benzyl Alcohol	.72906	.60516	16.99		
1,2-Dichlorobenzene	1.32240	1.29136	2.35		
2-Methylphenol	1.17367	1.30115	10.86		
3-6-4-Methylphenol	1.07139	1.07660	.49		
is(2-chloroisopropyl)Ether	2.15627	2.22471	3.17		
N-Nitroso-Di-n-Propylamine	.84050	.81297	3.28	**	
Hexachloroethane	.53840	.46704	13.25		
Dibromochloropropane	-	-	-		
Nitrobenzene	.40312	.41786	3.66		
Nitrobenzene-d5	.39137	.40291	2.95		
2-Nitrophenol	.24657	.26490	7.43	*	
Isophorone	.74170	.80349	8.33		
bis(2-Chloroethoxy)methane	.49386	.51855	5.00		
2,4-Dimethylphenol	.34849	.37183	6.70		
Benzoic Acid	.29725	.33261	11.90		
2,4-Dichlorophenol	.56733	.57850	1.97	*	
1,2,4-Trichlorobenzene	.36913	.36949	.10		
Naphthalene	.94589	.95208	.65		
4-Chloroaniline	.36309	.46515	28.11		
Hexachlorobutadiene	.20283	.20604	1.58	*	
4-Chloro-3-Methylphenol	.31360	.32550	3.80	*	
2-Methylnaphthalene	.56397	.55809	1.04		

RF - Response Factor from daily standard file at 60.00 mg/L

RF - Average Response Factor from Initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

Continuing Calibration Check
HSL Compounds

Case No: _____ Calibration Date: 10/13/88
Contractor: ENGINEERING-SCIENCE Time: 06:05
Contract No: _____ Laboratory ID: >S0155
Instrument ID: 1 Initial Calibration Date: 10/13/88

Minimum RF for SPCC is

Maximum % Diff for CCC is %

Compound	RF	RF	%Diff	CCC	SPCC
Hexachlorocyclopentadiene	.29568	.42010	42.08	**	
2,4,6-Trichlorophenol	.42280	.41720	1.32	*	
2,4,5-Trichlorophenol	.52897	.59048	11.63		
2-Fluorobiphenyl	1.27220	1.33877	5.23		
2-Chloronaphthalene	1.23784	1.29558	4.66		
2-Nitroaniline	.47288	.49676	5.05		
Dimethylphthalate	1.40629	1.41067	.31		
2,6-Dinitrotoluene	.37415	.38201	2.10		
Acenaphthylene	1.68918	1.75904	4.14		
3-Nitroaniline	.44557	.47985	7.69		
2,4-Dinitrophenol	.11898	.14319	20.34	**	
Acenaphthene	1.13011	1.11299	1.52	*	
Dibenzofuran	1.64131	1.68601	2.72		
2,4-Dinitrotoluene	.28418	.28483	.23		
2-Nitrophenol	.28450	.31568	10.96	**	
Fluorene	1.12850	1.05815	6.23		
Diethylphthalate	1.20939	1.12889	6.66		
4-Chlorophenyl-phenylether	.59183	.59889	1.19		
4-Nitroaniline	.35956	.38579	7.30		
2,4,6-Tribromophenol	.21023	.20195	3.94		
1,2-Diphenylhydrazine	-	-	-		
Alpha-BHC	-	-	-		
Beta-BHC	-	-	-		
Gamma-BHC	-	-	-		
Delta-BHC	-	-	-		
Heptachlor	-	-	-		
Aldrin	-	-	-		
N-Nitrosodiphenylamine	.40286	.48518	20.43	*	
4,6-Dinitro-2-Methylphenol	.10514	-	-		
4-Bromophenyl-phenylether	.21301	.21807	2.37		
Hexachlorobenzene	.26273	.26583	1.18		
Pentachlorophenol	.14536	.14829	2.02	*	

RF - Response Factor from daily standard file at 60.00 mg/L

RF - Average Response Factor from Initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

Continuing Calibration Check
HSL Compounds

Case No: _____ Calibration Date: 10/13/88
Contractor: ENGINEERING - SCIENCE Time: 06:05
Contract No: _____ Laboratory ID: >S0155
Instrument ID: 1 Initial Calibration Date: 10/13/88

Minimum RF for SPCC is

Maximum % Diff for CCC is %

Compound	RF	RF	%Diff	CCC SPCC
Phenanthrene	1.03431	1.02118	1.27	
Anthracene	1.05155	1.07180	1.93	
Di-n-Butylphthalate	1.51956	1.48606	2.20	
4,4'-Dibromobiphenyl	-	-	-	
Fluoranthene	1.19047	1.15840	2.69	*
Heptachlor Epoxide	-	-	-	
Endosulfan I	-	-	-	
4,4'-DDE	-	-	-	
Dieldrin	-	-	-	
Endrin	-	-	-	
4,4'-DDD	-	-	-	
Endosulfan II	-	-	-	
Endrin Aldehyde	-	-	-	
4,4'-DDT	-	-	-	
Endosulfan Sulfate	-	-	-	
Dibutylchlorodate	-	-	-	
Benzidine	.04023	.05956	48.05	
Pyrene	1.56086	1.47234	5.67	
Terphenyl-d14	1.05835	1.01204	4.38	
Butylbenzylphthalate	1.03390	1.00414	2.88	
3,3'-Dichlorobenzidine	.13689	.15815	15.53	
Chrysene	.99655	1.01219	1.57	
Benzo(a)Anthracene	1.10407	1.12933	2.29	
bis(2-Ethylhexyl)Phthalate	1.21073	1.17348	3.08	
Di-n-octylphthalate	3.40275	3.05709	10.16	*
Benzo(a)Pyrene	1.32098	1.30916	.90	*
Benzo(b)Fluoranthene	1.60850	1.56000	3.02	
Indeno(1,2,3-cd)Pyrene	.96800	.91524	5.45	
Dibenzo(a,h)Anthracene	.87481	.83034	5.08	
Benzo(k)Fluoranthene	1.44370	1.42801	1.09	
Benzo(g,h,i)Perylene	.89761	.85549	4.69	

RF - Response Factor from daily standard file at 60.00 mg/L

RF - Average Response Factor from Initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: Engineering Science Contract: OR001

Lab Code: _____ Case No.: _____ SAS No.: _____ Job No.: _____

Sample No. (Standard): STD 060

Date Analyzed: 10/13/88

Lab File ID (Standard): 50155

Time Analyzed: 9:55

Instrument ID: 1

	IS1 (DCB) AREA #	RT	IS2 (NPT) AREA #	RT	IS3 (ANT) AREA #	RT
12 HOUR STD	37123	9.28	119972	12.89	60112	18.38
UPPER LIMIT	74246	9.78	239944	13.39	120224	18.88
LOWER LIMIT	18562	8.78	59986	12.39	30056	17.88
EPA SAMPLE NO.						
50156 01 880821U6	42372	9.26	160372	12.85	88076	18.35
57 02 88082147	58328	9.26	139059	12.86	75325	18.36
58 03 88082148	41627	9.27	153688	12.85	82307	18.35
59 04 88082137 BN	45302	9.28	153888	12.87	89367	18.37
60 05 88081982 AC	39162	9.29	123200	12.97	75628	18.39
61 06 88082137 AC	63771	9.29	223185	12.89	127896*	18.38
62 07 88082256 AC	43597	9.27	153920	12.87	83059	18.37
67 03 88081981 BN	62452*	9.41	71611	13.23	41522	18.30
64 08 88081913 BN 4.00	39732	9.28	139683	12.88	76586	18.37
65 11 88082189 AC	36200	9.27	129654	12.86	67654	18.36
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

IS1 (DCB) = 1,4-Dichlorobenzene-d4

IS2 (NPT) = Naphthalene-d8

IS3 (ANT) = Acenaphthene-d8

UPPER LIMIT = - 100% of
internal standard area.

LOWER LIMIT = - 50% of
internal standard area.

* Column used to flag internal standard area values with an asterisk

Lab Name: Engineering ScienceContract: OR001

Lab Code: _____ Case No.: _____

SAS No.: _____ Job No.: _____

Sample No. (Standard): STD 0612Date Analyzed: 10/13/88Lab File ID (Standard): 50155Time Analyzed: 9:55

Instrument ID: _____

	IS4 (PHN)	RT	IS5 (CRY)	RT	IS4 (PRY)	RT
	AREA #		AREA #		AREA #	
=====	=====	=====	=====	=====	=====	=====
12 HOUR STD	98492	23.01	74816	31.49	46848	37.56
=====	=====	=====	=====	=====	=====	=====
UPPER LIMIT	196984	23.51	149692	31.99	93696	38.06
=====	=====	=====	=====	=====	=====	=====
LOWER LIMIT	49246	22.51	37423	30.99	23424	37.06
=====	=====	=====	=====	=====	=====	=====
EPA SAMPLE NO.						
=====	=====	=====	=====	=====	=====	=====
50155001 88082146	124131	23.00	88978	31.47	52346	37.55
5702 88082147	118133	23.00	87536	31.46	46049	37.55
5803 88082148	129816	23.00	100134	31.47	55340	37.55
5904 88082122 RN	149197	23.01	103378	31.47	66186	37.57
6005 88081982 AC	120158	23.03	84299	31.47	41785	37.57
6106 88082122 AC	207161*	23.04	151618*	31.49	89182	37.62
6207 88082250 AC	136211	23.01	86564	31.45	47388	37.55
6308 88081981 RN	82447	22.98	69082	31.45	38268	37.54
6409 88081983 RN	114815	23.01	79868	31.47	48531	37.57
6510 88082189 AC	104488	23.00	68082	31.45	35158	37.52
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

IS4 (PHN) = Phenanthrene-210

IS5 (CRY) = Chrysene-212

IS4 (PRY) = Pyrene-212

UPPER LIMIT = + 100%

of internal standard area.

LOWER LIMIT = - 50%

of internal standard area.

* Column used to flag internal standard area values with an asterisk

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DATA PACKAGE #59

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ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the soil samples received
by this laboratory on 7-13-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88071380	DANG-8-SS-F3	418.1	7-11-88	7-18-88	7-19-88	
88071380	DANG-8-SS-F3	MOIS	7-11-88		7-18-88	
88071380	DANG-8-SS-F3	8080	7-11-88	7-14-88	7-29-88	8-11-88
88071381	DANG-8-SS-B3	418.1	7-10-88	7-18-88	7-19-88	
88071381	DANG-8-SS-B3	MOIS	7-10-88		7-18-88	
88071381	DANG-8-SS-B3	8080	7-10-88	7-14-88	7-29-88	
88071382	DANG-8-SS-D2	418.1	7-11-88	7-18-88	7-19-88	
88071382	DANG-8-SS-D2	MOIS	7-11-88		7-18-88	
88071382	DANG-8-SS-D2	8080	7-11-88	7-14-88	7-29-88	
88071383	DANG-8-SS-D3	418.1	7-11-88	7-18-88	7-19-88	
88071383	DANG-8-SS-D3	MOIS	7-11-88		7-18-88	
88071383	DANG-8-SS-D3	8080	7-11-88	7-14-88	7-29-88	
88071384	DANG-8-SS-A3	418.1	7-11-88	7-18-88	7-19-88	
88071384	DANG-8-SS-A3	MOIS	7-11-88		7-18-88	
88071384	DANG-8-SS-A3	8080	7-11-88	7-14-88	7-29-88	8-11-88
88071385	DANG-8-SS-B2	418.1	7-11-88	7-18-88	7-19-88	
88071385	DANG-8-SS-B2	MOIS	7-11-88		7-18-88	
88071385	DANG-8-SS-B2	8080	7-11-88	7-14-88	7-29-88	8-11-88
88071386	DANG-8-SS-E3	418.1	7-11-88	7-18-88	7-19-88	
88071386	DANG-8-SS-E3	MOIS	7-11-88		7-18-88	
88071386	DANG-8-SS-E3	8080	7-11-88	7-14-88	7-29-88	
88071387	DANG-8-SS-A2	418.1	7-11-88	7-18-88	7-19-88	
88071387	DANG-8-SS-A2	MOIS	7-11-88		7-18-88	
88071387	DANG-8-SS-A2	8080	7-11-88	7-14-88	7-29-88	8-11-88
88071388	DANG-8-SS-G2	418.1	7-11-88	7-18-88	7-19-88	
88071388	DANG-8-SS-G2	MOIS	7-11-88		7-18-88	
88071388	DANG-8-SS-G2	8080	7-11-88	7-14-88	7-29-88	



ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88071389	DANG-8-SS-C3	418.1	7-11-88	7-18-88	7-19-88	
88071389	DANG-8-SS-C3	MOIS	7-11-88		7-18-88	
88071389	DANG-8-SS-C3	8080	7-11-88	7-14-88	7-19-88	
88071390	DANG-8-SS-C2	418.1	7-11-88	7-18-88	7-19-88	
88071390	DANG-8-SS-C2	MOIS	7-11-88		7-18-88	
88071390	DANG-8-SS-C2	8080	7-11-88	7-14-88	7-29-88	8-17-88
88071391	DANG-8-SS-D1	418.1	7-12-88	7-18-88	7-19-88	
88071391	DANG-8-SS-D1	MOIS	7-12-88		7-18-88	
88071391	DANG-8-SS-D1	8080	7-12-88	7-15-88	7-29-88	8-11-88
88071392	DANG-8-SS-G1	418.1	7-12-88	7-18-88	7-19-88	
88071392	DANG-8-SS-G1	MOIS	7-12-88		7-18-88	
88071392	DANG-8-SS-G1	8080	7-12-88	7-15-88	7-29-88	8-11-88
88071393	DANG-8-SS-E2	418.1	7-12-88	7-18-88	7-19-88	
88071393	DANG-8-SS-E2	MOIS	7-12-88		7-18-88	
88071393	DANG-8-SS-E2	8080	7-12-88	7-15-88	7-29-88	
88071394	DANG-8-SS-G0	418.1	7-12-88	7-18-88	7-19-88	
88071394	DANG-8-SS-G0	MOIS	7-12-88		7-18-88	
88071394	DANG-8-SS-G0	8080	7-12-88	7-15-88	7-29-88	8-11-88
88071395	DANG-8-SS-C0	418.1	7-12-88	7-18-88	7-20-88	
88071395	DANG-8-SS-C0	MOIS	7-12-88		7-18-88	
88071395	DANG-8-SS-C0	8080	7-12-88	7-15-88	7-30-88	
88071396	DANG-8-SS-C1	418.1	7-12-88	7-18-88	7-20-88	
88071396	DANG-8-SS-C1	MOIS	7-12-88		7-18-88	
88071396	DANG-8-SS-C1	8080	7-12-88	7-15-88	7-30-88	8-17-88
88071397	DANG-8-SS-B0	418.1	7-12-88	7-18-88	7-20-88	
88071397	DANG-8-SS-B0	MOIS	7-12-88		7-18-88	
88071397	DANG-8-SS-B0	8080	7-12-88	7-15-88	7-30-88	8-11-88
88071398	DANG-8-SS-F1	418.1	7-12-88	7-18-88	7-20-88	
88071398	DANG-8-SS-F1	MOIS	7-12-88		7-18-88	
88071398	DANG-8-SS-F1	8080	7-12-88	7-15-88	7-30-88	8-11-88
88071399	DANG-8-SS-A1	418.1	7-12-88	7-18-88	7-20-88	
88071399	DANG-8-SS-A1	MOIS	7-12-88		7-18-88	
88071399	DANG-8-SS-A1	8080	7-12-88	7-15-88	7-30-88	8-11-88
88071400	DANG-8-SS-E1	418.1	7-12-88	7-18-88	7-20-88	
88071400	DANG-8-SS-E1	MOIS	7-12-88		7-18-88	
88071400	DANG-8-SS-E1	8080	7-12-88	7-15-88	7-30-88	
88071401	DANG-8-SS-F0	418.1	7-12-88	7-18-88	7-20-88	
88071401	DANG-8-SS-F0	MOIS	7-12-88		7-18-88	
88071401	DANG-8-SS-F0	8080	7-12-88	7-15-88	7-30-88	

88-A1-DULU0008 2

CL-FRM01

ES**ENGINEERING-SCIENCE, INC.**600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

Project: Duluth ANGB

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col
88071402	DANG-8-SS-F2	418.1	7-12-88	7-18-88	7-20-88	
88071402	DANG-8-SS-F2	MOIS	7-12-88		7-18-88	
88071402	DANG-8-SS-F2	8080	7-12-88	7-15-88	7-30-88	
88071403	DANG-8-SS-B1	418.1	7-12-88	7-18-88	7-20-88	
88071403	DANG-8-SS-B1	MOIS	7-12-88		7-18-88	
88071403	DANG-8-SS-B1	8080	7-12-88	7-15-88	7-30-88	8-11-8
88071404	DANG-8-SS-A0	418.1	7-12-88	7-18-88	7-20-88	
88071404	DANG-8-SS-A0	MOIS	7-12-88		7-18-88	
88071404	DANG-8-SS-A0	8080	7-12-88	7-15-88	7-30-88	8-11-8
88071405	DANG-8-SS-D0	418.1	7-12-88	7-18-88	7-20-88	
88071405	DANG-8-SS-D0	MOIS	7-12-88		7-18-88	
88071405	DANG-8-SS-D0	8080	7-12-88	7-15-88	7-30-88	
88071406	DANG-8-SS-E0	418.1	7-12-88	7-18-88	7-20-88	
88071406	DANG-8-SS-E0	MOIS	7-12-88		7-18-88	
88071406	DANG-8-SS-E0	8080	7-12-88	7-15-88	7-30-88	

* If applicable

08/24/88

ANALYSIS REPORT

WORK ORDER NUMBER: 745
JOB NUMBER : ZB0000000440
WORK ORDER DATE : 07/15/88

APPROVED BY


Lab Supervisor

REPORT DATA:

5 OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:

ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37830

: OF REPORT COPIES: 1

CONTRACT / PO # : 00001
CONTACT : BILL HAYDEN

TASK: 5, UNITS: mg/Kg

	DANG-8-SS-F3 7-11-88 88071380	DANG-8-SS-B3 7-10-88 88071381	DANG-8-SS-D2 7-11-88 88071382	DANG-8-SS-D3 7-11-88 88071383	DANG-8-SS-A3 7-11-88 88071384	DANG-8-SS-B2 7-11-88 88071385
TEST COMPOUND						
18.1 PETROLEUM HYDROCARBONS	<100	<100	<100	<100	<100	<100
MOISTURE	7.2	13.5	5.8	7.3	8.5	14.3

08/24/88

ANALYSIS REPORT FOR WORK ORDER NUMBER 743

TASK: 3. UNITS: mg/Kg

TEST COMPOUND	DANG-8-SS-E3	DANG-8-SS-A2	DANG-8-SS-G2	DANG-8-SS-C3	DANG-8-SS-C2	DANG-8-SS-D1
	7-11-88	7-11-88	7-11-88	7-11-88	7-11-88	7-12-88
	88071386	88071387	88071388	88071389	88071390	88071391
418.1 PETROLEUM HYDROCARBONS	<100	100	<100	<100	<100	<100
% MOISTURE	38.3	5.6	5.6	10.5	6.3	4.8

ND - Not Detected

3067

ANALYSIS REPORT FOR WORK ORDER NUMBER 743

ASK: 5, UNITS: mg/Kg

EST COMPOUND	DANG-8-SS-G1	DANG-8-SS-E2	DANG-8-SS-G0	DANG-8-SS-C0	DANG-8-SS-C1	DANG-8-SS-B0
	7-12-88	7-12-88	7-12-88	7-12-88	7-12-88	7-12-88
	88071392	88071393	88071394	88071395	88071396	88071397
<hr/>						
18.1 PETROLEUM HYDROCARBONS	<100	<100	3040	<100	<100	<100
MOISTURE	5.0	5.8	19.1	5.6	4.8	6.0

3068

- Not Detected

08/24/88

ANALYSIS REPORT FOR WORK ORDER NUMBER 743

TASK: 5, UNITS: mg/Kg

	DANG-8-SS-F1	DANG-8-SS-A1	DANG-8-SS-E1	DANG-8-SS-F0	DANG-8-SS-F2	DANG-8-SS-B1
	7-12-88	7-12-88	7-12-88	7-12-88	7-12-88	7-12-88
TEST COMPOUND	88071398	88071399	88071400	88071401	88071402	88071403
418.1 PETROLEUM HYDROCARBONS	<100	740	<100	480	<100	<100
% MOISTURE	4.4	5.5	3.5	8.7	5.9	5.7

ND - Not Detected

3069

08/24/88

ANALYSIS REPORT FOR WORK ORDER NUMBER 743

ASK: 3, UNITS: mg/Kg

TEST COMPOUND	DANG-8-SS-AO	DANG-8-SS-DO	DANG-8-SS-EO
	7-12-88	7-12-88	7-12-88
	88071404	88071405	88071406
18.1 PETROLEUM HYDROCARBONS	1540	<100	<100
MOISTURE	17.7	5.3	4.6

08/24/88

ANALYSIS REPORT

WORK ORDER NUMBER: 745
 JOB NUMBER : Z80000000440
 WORK ORDER DATE : 07/15/88

APPROVED BY

Lab Supervisor

REPORT DATA:
 ES OAK RIDGE/DULUTH ANGB
 710 S. ILLINOIS AVE. STE. 5103
 OAK RIDGE, TN 37830
 BILL HAYDEN

CLIENT DATA:
 ES OAK RIDGE/DULUTH ANGB (154)
 710 S. ILLINOIS AVE. STE. 5103
 OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : 08001
 CONTACT : BILL HAYDEN

TASK: 4. UNITS: ug/KG, GROUP 8080

	DANG-8-SS-F3	DANG-8-SS-B3	DANG-8-SS-D2	DANG-8-SS-D3	DANG-8-SS-A3	DANG-8-SS-B2
	7-11-88	7-10-88	7-11-88	7-11-88	7-11-88	7-11-88
TEST COMPOUND	88071380	88071381	88071382	88071383	88071384	88071385
ALDRIN	ND	ND	ND	ND	ND	ND
ALPHA-BHC	ND	ND	ND	ND	ND	ND
BETA-BHC	ND	ND	ND	ND	ND	ND
DELTA-BHC	ND	ND	ND	ND	ND	ND
GAMMA-BHC	ND	ND	ND	ND	ND	ND
CHLORDANE	ND	ND	ND	ND	ND	ND
4,4'-DDD	29	ND	ND	ND	180	ND
4,4'-DDE	33	ND	ND	ND	130	ND
4,4'-DDT	77	ND	ND	ND	1500	ND
DIELDRIN	ND	ND	ND	ND	ND	ND
ENDOSULFAN I	ND	ND	ND	ND	ND	ND
ENDOSULFAN II	ND	ND	ND	ND	ND	ND
ENDOSULFAN SULFATE	ND	ND	ND	ND	ND	ND
ENDRIN	ND	ND	ND	ND	ND	ND
ENDRIN ALDEHYDE	NA	NA	NA	NA	NA	NA
HEPTACHLOR	ND	ND	ND	ND	ND	ND
HEPTACHLOR EPOXIDE	ND	ND	ND	ND	ND	ND
KEPONE	NA	NA	NA	NA	NA	NA
METHOXYCHLOR	ND	ND	ND	ND	ND	ND
TOXAPHENE	ND	ND	ND	ND	ND	ND
PCB-1016	ND	ND	ND	ND	ND	ND
PCB-1221	ND	ND	ND	ND	ND	ND
PCB-1232	ND	ND	ND	ND	ND	ND
PCB-1242	ND	ND	ND	ND	ND	ND
PCB-1248	ND	ND	ND	ND	ND	ND
PCB-1254	ND	ND	ND	ND	ND	ND
PCB-1260	ND	ND	ND	ND	ND	ND

ND - Not Detected

3071

ANALYSIS REPORT FOR WORK ORDER NUMBER 743

ASK: 4, UNITS: ug/KG, GROUP 8080

EST COMPOUND	DANG-8-SS-E3 7-11-88 88071386	DANG-8-SS-A2 7-11-88 88071387	DANG-8-SS-G2 7-11-88 88071388	DANG-8-SS-C3 7-11-88 88071389	DANG-8-SS-C2 7-11-88 88071390	DANG-8-SS-D1 7-12-88 88071391
LDORIN	ND	ND	ND	ND	ND	ND
CPHA-BHC	ND	ND	ND	ND	ND	ND
ETA-BHC	ND	ND	ND	ND	ND	ND
ELTA-BHC	ND	ND	ND	ND	ND	ND
AMMA-BHC	ND	ND	ND	ND	ND	ND
ALORDANE	ND	ND	ND	ND	ND	ND
,4'-DDO	ND	ND	ND	ND	ND	ND
,4'-DDE	ND	ND	ND	ND	ND	ND
,4'-DDT	ND	74	ND	ND	ND	ND
ELDORIN	ND	ND	ND	ND	ND	ND
DDOSULFAN I	ND	ND	ND	ND	ND	ND
DDOSULFAN II	ND	ND	ND	ND	ND	ND
DDOSULFAN SULFATE	ND	ND	ND	ND	ND	ND
NDORIN	ND	ND	ND	ND	ND	ND
NDORIN ALDEHYDE	NA	NA	NA	NA	NA	NA
EPTACHLOR	ND	ND	ND	ND	ND	ND
EPTACHLOR EPOXIDE	ND	ND	ND	ND	ND	ND
EPONE	NA	NA	NA	NA	NA	NA
ETHOXYCHLOR	ND	ND	ND	ND	ND	ND
OXAPHENE	ND	ND	ND	ND	ND	ND
CB-1016	ND	ND	ND	ND	ND	ND
CB-1221	ND	ND	ND	ND	ND	ND
CB-1232	ND	ND	ND	ND	ND	ND
CB-1242	ND	ND	ND	ND	ND	ND
CB-1248	ND	ND	ND	ND	ND	ND
CB-1254	ND	ND	ND	ND	ND	350
CB-1260	ND	ND	ND	ND	ND	ND

08/24/88

ANALYSIS REPORT FOR WORK ORDER NUMBER 743

TASK: 4. UNITS: ug/KG. GROUP 8080

	DANG-8-SS-G1	DANG-8-SS-E2	DANG-8-SS-G0	DANG-8-SS-C0	DANG-8-SS-C1	DANG-8-SS-B0
	7-12-88	7-12-88	7-12-88	7-12-88	7-12-88	7-12-88
TEST COMPOUND	88071392	88071393	88071394	88071395	88071396	88071397
ALDRIN	ND	ND	ND	ND	ND	ND
ALPHA-BHC	ND	ND	ND	ND	ND	ND
BETA-BHC	ND	ND	ND	ND	ND	ND
DELTA-BHC	ND	ND	ND	ND	ND	ND
GAMMA-BHC	ND	ND	ND	ND	ND	ND
CHLORDANE	ND	ND	ND	ND	ND	ND
4,4'-DDO	ND	ND	ND	ND	ND	21
4,4'-DDE	ND	ND	ND	ND	ND	18
4,4'-DDT	95	ND	ND	ND	ND	ND
DIELDRIN	ND	ND	ND	ND	33	ND
ENDOSULFAN I	ND	ND	ND	ND	ND	ND
ENDOSULFAN II	ND	ND	ND	ND	ND	ND
ENDOSULFAN SULFATE	ND	ND	ND	ND	ND	ND
ENDRIN	ND	ND	ND	ND	ND	ND
ENDRIN-ALDEHYDE	NA	NA	NA	NA	NA	NA
HEPTACHLOR	ND	ND	ND	ND	ND	ND
HEPTACHLOR EPOXIDE	ND	ND	ND	ND	ND	ND
KEPONE	NA	NA	NA	NA	NA	NA
METHOXYCHLOR	ND	ND	ND	ND	ND	ND
TOXAPHENE	ND	ND	ND	ND	ND	ND
PCB-1016	ND	ND	ND	ND	ND	ND
PCB-1221	ND	ND	ND	ND	ND	ND
PCB-1252	ND	ND	ND	ND	ND	ND
PCB-1242	ND	ND	ND	ND	ND	ND
PCB-1248	ND	ND	ND	ND	ND	ND
PCB-1254	ND	ND	ND	ND	ND	ND
PCB-1260	ND	ND	ND	ND	ND	ND

ND - Not Detected

3073

08/24/88

ANALYSIS REPORT FOR WORK ORDER NUMBER 743

ASK: 4, UNITS: ug/KG, GROUP 8080

	DANG-8-SS-F1	DANG-8-SS-A1	DANG-8-SS-E1	DANG-8-SS-F0	DANG-8-SS-F2	DANG-8-SS-B1
	7-12-88	7-12-88	7-12-88	7-12-88	7-12-88	7-12-88
EST COMPOUND	88071398	88071399	88071400	88071401	88071402	88071403
LORIN	ND	ND	ND	ND	ND	ND
LPMA-BHC	ND	ND	ND	ND	ND	ND
ETA-BHC	ND	ND	ND	ND	ND	ND
ELTA-BHC	ND	ND	ND	ND	ND	ND
AMMA-BHC	ND	ND	ND	ND	ND	ND
HLORDANE	ND	ND	ND	ND	ND	ND
.4'-DDO	ND	25	ND	ND	ND	31
.4'-DOE	ND	27	ND	ND	ND	ND
.4'-DDT	20	110	ND	ND	24	71
IELORIN	ND	ND	ND	ND	ND	ND
NDOSULFAN I	ND	ND	ND	ND	ND	ND
NDOSULFAN II	ND	ND	ND	ND	ND	ND
NDOSULFAN SULFATE	ND	ND	ND	ND	ND	ND
NDRAIN	ND	ND	ND	ND	ND	ND
NORIN ALDEHYDE	NA	NA	NA	NA	NA	NA
EPTACHLOR	ND	ND	ND	ND	ND	ND
EPTACHLOR EPOXIDE	ND	ND	ND	ND	ND	ND
EPONE	NA	NA	NA	NA	NA	NA
ETHOXYCHLOR	ND	ND	ND	ND	ND	ND
OXAPHENE	ND	ND	ND	ND	ND	ND
CB-1016	ND	ND	ND	ND	ND	ND
CB-1221	ND	ND	ND	ND	ND	ND
CB-1232	ND	ND	ND	ND	ND	ND
CB-1242	ND	ND	ND	ND	ND	ND
CB-1248	ND	ND	ND	ND	ND	ND
CB-1254	ND	ND	ND	ND	ND	ND
CB-1250	ND	ND	ND	ND	ND	ND

08/24/88

ANALYSIS REPORT FOR WORK ORDER NUMBER 743

TASK: 4, UNITS: ug/KG, GROUP 8080

TEST COMPOUND	DANG-8-SS-A0 7-12-88 88071404	DANG-8-SS-00 7-12-88 88071405	DANG-8-SS-E0 7-12-88 88071406
ALDRIN	ND	ND	ND
ALPHA-BHC	ND	ND	ND
BETA-BHC	ND	ND	ND
DELTA-BHC	ND	ND	ND
GAMMA-BHC	ND	ND	ND
CHLORDANE	ND	ND	ND
4,4'-DDD	ND	ND	ND
4,4'-DDE	ND	ND	ND
4,4'-DDT	ND	ND	ND
DIELDRIN	ND	ND	ND
ENDOSULFAN I	ND	ND	ND
ENDOSULFAN II	ND	ND	ND
ENDOSULFAN SULFATE	ND	ND	ND
ENDRIN	ND	ND	ND
ENDRIN ALDEHYDE	NA	NA	NA
HEPTACHLOR	ND	ND	ND
HEPTACHLOR EPOXIDE	ND	ND	ND
KEPONE	NA	NA	NA
METHOXYCHLOR	ND	ND	ND
TOXAPHENE	ND	ND	ND
PCB-1016	ND	ND	ND
PCB-1221	ND	ND	ND
PCB-1232	ND	ND	ND
PCB-1242	ND	ND	ND
PCB-1248	ND	ND	ND
PCB-1254	ND	ND	ND
PCB-1260	ND	ND	ND

ND - Not Detected

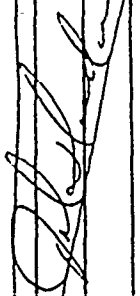
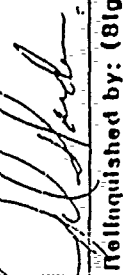
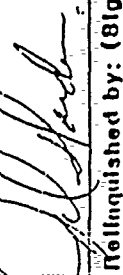
3075

DRAFT

ENGINEERING & SCIENCE

CHAIN OF CUSTODY RECORD CC-1

FIGURE 5.1

ES JOB NO. OR-001	PROJECT NAME/LOCATION DULUTH ANG BASE		NO. OF CON- TAINERS	ANALYSES REQUIRED						SHIP TO:	
	SAMPLE DESCRIPTION			VOA - SW8010, SW8020	SEM/ICR - SW8020	PET HYDRO - SW8270	ANALYT - SW8270, SW8280, SW8290, SW8300, SW8310	ANALYT - SW8270, SW8280, SW8290, SW8300, SW8310	ENGINEERING-SCIENCE, INC LABORATORY SERVICES DIVISION 800 BANCROFT WAY BERKELEY, CALIFORNIA 94710	REMARKS	
	DATE	TIME									
	7-11-88	1700	1	DANG-8-SS-F3	X	X	X	X			
	7-10-88	1700	1	DANG-8-SS-B3	X	X	X	X			
	7-11-88	1733	1	DANG-8-SS-D2	X	X	X	X			
	7-11-88	1647	1	DANG-8-SS-D3	X	X	X	X			
	7-11-88	1606	1	DANG-8-SS-A3	X	X	X	X			
	7-11-88	1719	1	DANG-8-SS-B2	X	X	X	X			
	7-11-88	1651	1	DANG-8-SS-E3	X	X	X	X			
	7-11-88	1705	1	DANG-8-SS-A2	X	X	X	X			
	7-11-88	1733	1	DANG-8-SS-G2	X	X	X	X			
	7-11-88	1626	1	DANG-8-SS-C3	X	X	X	X			
	7-11-88	1725	1	DANG-8-SS-C2	X	X	X	X			
											
Relinquished by: (Signature)				Received by: (Signature)				Date/Time			
								7/12/88			
Relinquished by: (Signature)				Received for Laboratory by: (Signature)				Date/Time			
											

Distribution: Original Accompanies Shipment, Copy to Coordinator Field File

3076

DRAFT

FEDERAL
Express

AIRBILL

USE THIS AIRBILL FOR LOGIC SHIPMENTS TO THE CONTINENTAL U.S.A., ALASKA AND HAWAII.
USE THE INTERNATIONAL AIRWAY FOR SHIPMENTS TO PUERTO RICO.
QUESTIONS? CALL 800-235-5555 TOLL FREE.

31094 0103 28370000

PACKAGE
TRACKING NUMBER
0103 28370000

SENDER'S COPY

SENDER'S COPY

Sender's Federal Express Account Number 0300-0681-0		Date 07-12-84	
From (Your Name) Please Print ENGINEERING SCIENCE		Your Phone Number (Very Important) 415-841-7353	
Company ENGINEERING SCIENCE		Department/Floor No. 415-841-7353	
Street Address 57 EXECUTIVE PARK S STE 550		Exact Street Address (No Capital Letter to P.O. Box or P.O. Box)	
City ATLANTA		City P.O. Box 1000	
State GA		State CA	
ZIP Required 30302-29		ZIP Required 94710	
YOUR BILLING REFERENCE INFORMATION (FIRST 24 CHARACTERS WILL APPEAR ON INVOICE)			
PAYMENT <input type="checkbox"/> Bill Sender <input type="checkbox"/> Bill Recipient's FedEx Account No. <input type="checkbox"/> Bill 3rd Party FedEx Account No. <input type="checkbox"/> Bill Credit Card			
SERVICES		DELIVERY AND SPECIAL HANDLING	
1 <input checked="" type="checkbox"/> PRIORITY 1 Overnight Delivery		1 <input type="checkbox"/> HOLD FOR PICK-UP	
2 <input type="checkbox"/> COURIER-PAK Overnight Envelope		2 <input checked="" type="checkbox"/> DELIVER SATURDAY	
3 <input type="checkbox"/> OVERNIGHT BOX		3 <input type="checkbox"/> DELIVER SATURDAY	
4 <input type="checkbox"/> OVERNIGHT TUBE		4 <input type="checkbox"/> DELIVER SATURDAY	
5 <input type="checkbox"/> STANDARD AIR Delivery not later than second business day		5 <input type="checkbox"/> DELIVER SATURDAY	
6 <input type="checkbox"/> OVERNIGHT LETTER		6 <input type="checkbox"/> DELIVER SATURDAY	
7 <input type="checkbox"/> COURIER-PAK Overnight Envelope		7 <input type="checkbox"/> DELIVER SATURDAY	
8 <input type="checkbox"/> OVERNIGHT BOX		8 <input type="checkbox"/> DELIVER SATURDAY	
9 <input type="checkbox"/> OVERNIGHT TUBE		9 <input type="checkbox"/> DELIVER SATURDAY	
10 <input type="checkbox"/> STANDARD AIR Delivery not later than second business day		10 <input type="checkbox"/> DELIVER SATURDAY	
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3078

M-7

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: TPH-S-0032-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 7-13-88
Date Prepared: 7-18-88
Date Analyzed: 7-19-88
Date Reported: 7-26-88
Dilution Factor: NA
%Moisture: 7

Project: Duluth ANGB
Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88071380-88071392

[Signature]

Laboratory Duplicates	Sample Nos. Spike	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88071380	88071380	418.1	<100	<100	1077	670	62	650	60	3	*

3079

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* = Percent recoveries are within the ES Laboratory QC limits.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$
Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: TPH-S-0033-88
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: 7-13-88
Date Prepared: 7-13-88
Date Analyzed: 7-20-88
Date Reported: 7-26-88
Dilution Factor: NA
%Moisture: 4

Project: Duluth ANGB

Laboratory Supervisor Approval:
W.B. Buxton

QC Report for Laboratory Sample No(s):
88071393-88071406

Laboratory Duplicates	Sample Nos. Spike	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88071393	88071393	418.1	<100	<100	1040	790	76	850	82	7	

3080

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

SR = Sample Result
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY
ORGANOCHLORINE PESTICIDES AND PCB'S
SW METHOD 8080

Job No.: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: OCP-S-0016-88B
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: NA
Date Prepared: 7-14-88
Date Analyzed: 7-29-88
Date Reported: 8-24-88
Dilution Factor: NA
%Moisture: NA

Project: Duluth ANGB
Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88071380-88071399

[Signature]

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	EPA RPD	QC Limits %Recovery
Blank	Aldrin	6.67	ND	6.17	92	6.90	103	11	43	34-132
	q-BHC(Lindane)	6.67	ND	5.83	87	6.63	99	13	50	46-127
	Dieldrin	16.7	ND	17.7	106	19.4	116	9	38	31-134
	Endrin	16.7	ND	18.3	110	20.0	120	9	45	42-139
	Heptachlor	6.67	ND	7.50	112	8.13	122	8	31	35-130
	4,4'-DDT	16.7	ND	20.8	125	21.5	129	3	50	23-134
	PCB-1260									

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

$$\text{Relative Percent Difference (RPD)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(\text{MS or MSD}) - \text{SR} \times 100}{\text{SA}}$$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

W.B. Bunt

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Sample Matrix: Soil
Conc. Unit: ug/KG
Date Reported: 8-24-88

Laboratory Supervisor Approval:

AWB

Project: Duluth ANGB

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
C728A14A	7-29-88	OCP	Mixed Phase	--	None Found	--	--	88071380-88071399
C728A44A	7-30-88	OCP	Mixed Phase	--	None Found	--	--	88071400-88071406

3083

QUALITY CONTROL RESULTS SUMMARY
ORGANOCHLORINE PESTICIDES AND PCB'S
SW METHOD 8080

Job No.: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: OCP-S-0016-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 7-13-88
Date Prepared: 7-14-88
Date Analyzed: 7-29-88
Date Reported: 8-24-88
Dilution Factor: 10
%Moisture: 7

Project: Duluth ANGB

QC Report for Laboratory Sample No(s):
88071380-88071399
Laboratory Supervisor Approval:
CAV Burt

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	EPA RPD	QC Limits %Recovery
88071380 3084	Aldrin	7.20	ND	5.08	70	5.94	82	16	43	34-132
	q-BHC(Lindane)	7.20	ND	1.92	27*	6.41	89	108*	50	46-127
	Dieldrin	18.0	ND	ND*	NC*	ND*	NC*	NC*	38	31-134
	Endrin	18.0	ND	13.8	77	14.4	80	4	45	42-139
	Heptachlor	7.20	ND	10.5	145*	11.3	157*	7	31	35-130
	4,4'-DDT	18.0	77	97.6	114	94.0	94	4	50	23-134
	PCB-1260	---	---	---	---	---	---	---	---	---

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* = See Case Narrative attached.

$$\text{Relative Percent Difference (RPD)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

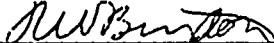
$$\text{Percent Recovery (PR)} = \frac{(\text{MS or MSD}) - \text{SR} \times 100}{\text{SA}}$$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)
NA = Not Applicable
NC = Not Calculated
ND = Not Detected

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
Samples No.: 88071380-88071399
QC REPORT NO.: OCP-S-0016-88

The matrix spiking compounds were added to samples 88071380-MS and MSD at levels lower than normal CLP spiking levels. In addition, there were interferences with Lindane and Dieldrin. The Lindane results are not very accurate, and the Dieldrin could not be calculated. Note that spiked blanks produced acceptable QC results.

418.1 INITIAL & CONTINUING CALIBRATION DATA

Job No.:	OR001	Calibration Date:	7-19-88
Client:	ES Oak Ridge	Instrument I.D.:	Perkin Elmer 257
Attn:	Bill Hayden	Grating Infrared Spectrophotometer	
Address:	710 S. Illinois Avenue	Unit:	mg/L
	Suite F-103	Date Reported:	11-09-88
	Oak Ridge, Tn. 37830	R=	0.9975
Project:	Duluth ANGB	Laboratory Supervisor Approval:	
Laboratory Sample No(s).:	88071380-88071392		

Standard	Concentration	Absorbance	/Continuous RF /Calibration /Verification
No. 1	0.59	0.148	RF = 5.65
No. 2	1.2	0.251	
No. 3	1.8	0.376	
No. 4	2.4	0.460	
Cont. Cal. No. 2 (88071380-88071384+QC)	1.17	0.251	98%
Cont. Cal. No. 2 (88071385-88071392)	1.17	0.251	98%

418.1 INITIAL & CONTINUING CALIBRATION DATA

Job No.: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, In. 37830

Calibration Date: 7-20-88
Instrument I.D.: Perkin Elmer 257
Grating Infrared Spectrophotometer

Unit: mg/L
Date Reported: 11-09-88
R= 0.9978

Project: Duluth ANGB

Laboratory Supervisor Approval:

Laboratory Sample No(s):
88071393-88071406

MB

Standard	Concentration	Absorbance	/Continuous RF /Calibration /Verification
No. 1	0.59	0.123	RF = 5.43
No. 2	1.2	0.227	
No. 3	1.8	0.327	
No. 4	2.4	0.458	
Cont. Cal. No. 2 (88071393-88071395)	1.19	0.227	99%
Cont. Cal. No. 2 (88071396-88071404)	1.23	0.235	102%
Cont. Cal. No. 2 (88071405-88071406)	1.32	0.252	110%

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001 QC Report No: TPH-S-0032-88
Client: ES Oak Ridge Sample Matrix: Soil
Attn: Bill Hayden Conc. Unit: mg/KG
Address: 710 S. Illinois Avenue Date Received: 7-13-88
Suite F-103 Date Prepared: 7-18-88
Oak Ridge, Tn. 37830 Date Analyzed: 7-19-88
Date Reported: 7-26-88
Dilution Factor: NA
Moisture: 7

Project: Duluth ANGB Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88071380-88071392

[Signature]

Laboratory Duplicates	Sample Nos. Spike	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88071380	88071380	418.1	<100	<100	1077	670	62	650	60	3	*
3000											

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* = Percent recoveries are within the ES Laboratory QC limits.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$ MS = Spike Sample NA = Not Applicable
MSD = Spike Duplicate NC = Not Calculated
SR = Sample Result ND = Not Detected
SA = Spike Added (Concentration)

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: TPH-S-0032-88B
Sample Matrix: Soil
Conc. Unit: mg/KG
Date Received: NA
Date Prepared: 7-18-88
Date Analyzed: 7-19-88
Date Reported: 11-15-88
Dilution Factor: NA
%Moisture: NA

Project: Duluth ANGB
Laboratory Supervisor Approval: *[Signature]*

QC Report for Laboratory Sample No(s):
88071380-88071392

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
Blank	418.1	<100	<100	1000	780	78	770	77	1	
3089										

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$ MS = Spike Sample
MSD = Spike Duplicate
NA = Not Applicable
NC = Not Calculated
ND = Not Detected

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$ SR = Sample Result
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.:

OR001

Client:

ES Oak Ridge

Attn:

Bill Hayden

Address:

710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No:

TPH-S-0033-88

Sample Matrix:

Soil

Conc. Unit:

mg/KG

Date Received:

7-13-88

Date Prepared:

7-13-88

Date Analyzed:

7-20-88

Date Reported:

7-26-88

Dilution Factor:

NA

%Moisture:

4

Project:

Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):

88071393-88071406

W. B. Briston

Laboratory Duplicates	Sample Nos. Spike	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88071393	88071393	418.1	<100	<100	1040	790	76	850	82	7	
3090											

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

Percent Recovery (PR) = $\frac{SSR - SR}{SA} \times 100$

SR = Sample Result
SA = Spike Added (Concentration)

DATA PACKAGE #60

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ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

page 1 of 5

Date Received: August 31, 1988
Date Reported: December 7, 1988

Work Order: 932
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082192	88082193
Sample No.:	DANGB-3-MW30-SS1	DANGB-3-MW30-SS1A
Date Sampled:	08-30-88	08-30-88
Time Sampled:	11:10	11:12
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-19-88	11-30-88
Percent Moisture:	8	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
,3-Dichlorobenzene	330	ND	ND
,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Bis(2-chloroethyl)ether	330	ND	ND
,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Bis(2-chloroisopropyl)ether	330	ND	ND
-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
Nitrobenzene	330	ND	ND
sophorone	330	ND	ND
Naphthalene	330	ND	ND
Bis(2-chloroethoxy)methane	330	ND	ND
-Chloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
Acenaphthylene	330	ND	ND
acenaphthene	330	ND	ND
Dimethyl phthalate	330	ND	ND
2,6-Dinitrotoluene	330	ND	ND
Fluorene	330	ND	ND
,4-Dinitrotoluene	330	ND	ND
Diethyl phthalate	330	ND	ND
N-Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

= Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

page 2 of 5

ate Received: August 31, 1988
ate Reported: December 7, 1988

Work Order: 932
Job Number: OR001

DR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

ab Number:	88082192	88082193
ample No.:	DANGB-3-MW30-SS1	DANGB-3-MW30-SS1A
ate Sampled:	08-30-88	08-30-88
ime Sampled:	11:10	11:12
ate Extracted:	09-10-88	09-10-88
ate Analyzed:	10-19-88	11-30-88
ercent Moisture:	8	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
benanthrene	330	ND	ND
anthracene	330	ND	ND
ibutyl phthalate	330	ND	ND
luoranthene	330	ND	ND
-Chlorophenyl phenyl ether	330	ND	ND
/rene	330	ND	ND
utyl Benzyl phthalate	330	ND	ND
is(2-ethylhexyl) phthalate	330	ND	ND
arysene	330	ND	ND
-Bromophenyl phenyl ether	330	ND	ND
enzo(a)anthracene	330	ND	ND
i-n-octylphthalate	330	ND	ND
enzo(b)fluoranthene	330	ND	ND
enzo(k)fluoranthene	330	ND	ND
enzidine	2000	ND	ND
,3'-Dichlorobenzidine	660	ND	ND
enzo(a)pyrene	330	ND	ND
deno(1,2,3-cd)pyrene	330	ND	ND
ibenzo(a,h)anthracene	330	ND	ND
enzo(ghi)perylene	330	ND	ND
enzyl Alcohol	660	ND	ND

= Compound was detected in the blank.

Base Neutrals - SW 8270

Matrix: Soil

(continued)

Date Received: August 31, 1988
 Date Reported: December 7, 1988

Work Order: 932
 Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB
 Address: 710 S. Illinois Ave, Suite F-103
 Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082192	88082193
Sample No.:	DANGB-3-MW30-SS1	DANGB-3-MW30-SS1A
Date Sampled:	08-30-88	08-30-88
Time Sampled:	11:10	11:12
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-19-88	11-30-88
Percent Moisture:	8	8

Compound	Detection Limits ug/kg	Analytical Results (dry weight)	
		ug/kg	ug/kg
Acetophenone	---	ND	ND
Aniline	---	ND	ND
4-Aminobiphenyl	---	ND	ND
4-Chloroaniline	660	ND	ND
1-Chloronaphthalene	---	ND	ND
Dibenzofuran	330	ND	ND
p-Dimethylaminoazobenzene	---	ND	ND
7,12-Dimethylbenz(a)anthracene	---	ND	ND
2,6-Dimethylphenethylamine	---	ND	ND
Diphenylamine	---	ND	ND
1,2-Diphenylhydrazine	---	ND	ND
Ethyl methanesulfonate	---	ND	ND
3-Methylcholanthrene	---	ND	ND
Methyl methanesulfonate	---	ND	ND
2-Methylnaphthalene	330	ND	ND
1-Naphthylamine	---	ND	ND
2-Naphthylamine	---	ND	ND
3-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
1-Nitroaniline	1600	ND	ND
4-Nitroso-di-n-butylamine	---	ND	ND
4-Nitrosopiperidine	---	ND	ND
Pentachlorobenzene	---	ND	ND
Pentachloronitrobenzene	---	ND	ND
Phenacetin	---	ND	ND
2-Picoline	---	ND	ND
Pronamide	---	ND	ND
2,4,5-Tetrachlorobenzene	---	ND	ND

EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

page 4 of 5

Date Received: August 31, 1988
Date Reported: December 7, 1988

Work Order: 932
Job Number: OR001

Location: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082192	88082193
Sample No.:	DANGB-3-MW30-SS1	DANGB-3-MW30-SS1A
Date Sampled:	08-30-88	08-30-88
Time Sampled:	11:10	11:12
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-19-88	11-30-88
Percent Moisture:	8	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
alpha-BHC	--*	ND	ND
gamma-BHC	--*	ND	ND
delta-BHC	660	ND	ND
gamma-chlor	330	ND	ND
delta-BHC	500	ND	ND
lindrin	330	ND	ND
gamma-chlor epoxide	330	ND	ND
endosulfan I	--*	ND	ND
ieldrin	500	ND	ND
,4'-DDE	1000	ND	ND
ndrin	--*	ND	ND
ndosulfan II	--*	ND	ND
,4'-DDD	500	ND	ND
,4'-DDT	830	ND	ND
ndosulfan Sulfate	1000	ND	ND
ndrin aldehyde	--*	ND	ND
ndrin Ketone	--*	ND	ND
lindane	2000	ND	ND
methoxychlor	--*	ND	ND
oxaphene	2000	ND	ND
rochlor-1016	2000	ND	ND
rochlor-1221	2000	ND	ND
rochlor-1232	2000	ND	ND
rochlor-1242	2000	ND	ND
rochlor-1248	2000	ND	ND
rochlor-1254	2000	ND	ND
rochlor-1260	2000	ND	ND

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

page 5 of 5

Date Received: August 31, 1988
Date Reported: December 7, 1988

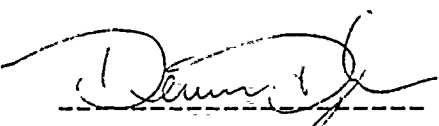
Work Order: 932
Job Number: OR001

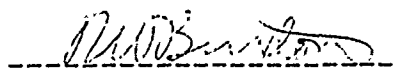
OR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082192	88082193
Sample No.:	DANGB-3-MW30-SS1	DANGB-3-MW30-SS1A
Date Sampled:	08-30-88	08-30-88
Time Sampled:	11:10	11:12
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-19-88	11-30-88
Percent Moisture:	8	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
1-Chlorophenol	330	ND	ND
2-Nitrophenol	330	ND	ND
Phenol	330	ND	ND
2,4-Dimethylphenol	330	ND	ND
2,4-Dichlorophenol	330	ND	ND
2,4,6-Trichlorophenol	330	ND	ND
1-Chloro-3-methylphenol	660	ND	ND
2,4-Dinitrophenol	1600	ND	ND
2,6-Dichlorophenol	--*	ND	ND
1-Methyl-4,6-Dinitrophenol	1600	ND	ND
Pentachlorophenol	1600	ND	ND
4-Nitrophenol	1600	ND	ND
Benzoic Acid	1600	ND	ND
1-Methylphenol	330	ND	ND
3- & 4-Methylphenol	330	ND	ND
2,3,4,6-Tetrachlorophenol	--*	ND	ND
2,4,5-Trichlorophenol	330	ND	ND


Analyst


Laboratory Supervisor

EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

page 1 of 5

ate Received: August 31, 1988
ate Reported: December 7, 1988

Work Order: 932
Job Number: OR001

OR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

ab Number:	88082194	88082195
ample No.:	DANGB-3-MW30-SS2	DANGB-3-MW30-SS3
ate Sampled:	08-30-88	08-30-88
ime Sampled:	11:24	11:30
ate Extracted:	09-10-88	09-10-88
ate Analyzed:	10-18-88	10-18-88
ercent Moisture:	8	11

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
,3-Dichlorobenzene	330	ND	ND
,4-Dichlorobenzene	330	ND	ND
exachloroethane	330	ND	ND
is(2-chloroethyl)ether	330	ND	ND
,2-Dichlorobenzene	330	ND	ND
-Nitrosodimethylamine	330	ND	ND
is(2-chloroisopropyl)ether	330	ND	ND
-Nitrosodi-n-propylamine	330	ND	ND
exachlorobutadiene	330	ND	ND
,2,4-Trichlorobenzene	330	ND	ND
itrobenzene	330	ND	ND
sophorone	330	ND	ND
aphthalene	330	ND	ND
is(2-chloroethoxy)methane	330	ND	ND
-Chloronaphthalene	330	ND	ND
exachlorocyclopentadiene	330	ND	ND
cenaphthylene	330	ND	ND
cenaphthene	330	ND	ND
imethyl phthalate	330	ND	ND
,6-Dinitrotoluene	330	ND	ND
luorene	330	ND	ND
,4-Dinitrotoluene	330	ND	ND
iethyl phthalate	330	ND	ND
-Nitrosodiphenylamine	330	ND	ND
exachlorobenzene	330	ND	ND

= Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

page 2 of 5

Date Received: August 31, 1988
Date Reported: December 7, 1988

Work Order: 932
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082194	88082195
Sample No.:	DANGB-3-MW30-SS2	DANGB-3-MW30-SS3
Date Sampled:	08-30-88	08-30-88
Time Sampled:	11:24	11:30
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-18-88	10-18-88
Percent Moisture:	8	11

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Dibutyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Butyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
4-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benzidine	2000	ND	ND
3,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

ND = Compound was detected in the blank.

Base Neutrals - SW 8270

Matrix: Soil

(continued)

ate Received: August 31, 1988
 ate Reported: December 7, 1988

Work Order: 932
 Job Number: OR001

or: ES:Oak Ridge/Duluth ANGB
 Address: 710 S. Illinois Ave, Suite F-103
 Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

ab Number:	88082194	88082195
ample No.:	DANGB-3-MW30-SS2	DANGB-3-MW30-SS3
ate Sampled:	08-30-88	08-30-88
ime Sampled:	11:24	11:30
ate Extracted:	09-10-88	09-10-88
ate Analyzed:	10-18-88	10-18-88
ercent Moisture:	8	11

Compound	Detection Limits ug/kg	Analytical Results (dry weight)	
		ug/kg	ug/kg
acetophenone	---	ND	ND
aniline	---	ND	ND
-Aminobiphenyl	---	ND	ND
-Chloroaniline	660	ND	ND
-Chloronaphthalene	---	ND	ND
ibenzofuran	330	ND	ND
-Dimethylaminoazobenzene	---	ND	ND
,12-Dimethylbenz(a)anthracene	---	ND	ND
-,a-Dimethylphenethylamine	---	ND	ND
iphenylamine	---	ND	ND
,2-Diphenylhydrazine	---	ND	ND
thyl methanesulfonate	---	ND	ND
-Methylcholanthrene	---	ND	ND
ethyl methanesulfonate	---	ND	ND
-Methylnaphthalene	330	ND	ND
-Naphthylamine	---	ND	ND
-Naphthylamine	---	ND	ND
-Nitroaniline	1600	ND	ND
-Nitroaniline	1600	ND	ND
-Nitroaniline	1600	ND	ND
-Nitroso-di-n-butylamine	---	ND	ND
-Nitrosopiperidine	---	ND	ND
entachlorobenzene	---	ND	ND
entachloronitrobenzene	---	ND	ND
enacetin	---	ND	ND
-Picoline	---	ND	ND
ronamide	---	ND	ND
,2,4,5-Tetrachlorobenzene	---	ND	ND

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

page 4 of 5

Date Received: August 31, 1988
Date Reported: December 7, 1988

Work Order: 932
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082194	88082195
Sample No.:	DANGB-3-MW30-SS2	DANGB-3-MW30-SS3
Date Sampled:	08-30-88	08-30-88
Time Sampled:	11:24	11:30
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-18-88	10-18-88
Percent Moisture:	8	11

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Alpha-BHC	--*	ND	ND
Gamma-BHC	--*	ND	ND
Beta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Aldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
Dieldrin	500	ND	ND
4,4'-DDE	1000	ND	ND
Endrin	--*	ND	ND
Endosulfan II	--*	ND	ND
4,4'-DDD	500	ND	ND
4,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	--*	ND	ND
Endrin Ketone	--*	ND	ND
Chlordane	2000	ND	ND
Methoxychlor	--*	ND	ND
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1248	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

page 5 of 5

ate Received: August 31, 1988
ate Reported: December 7, 1988

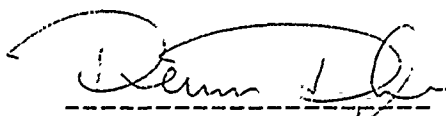
Work Order: 932
Job Number: OR001

DR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

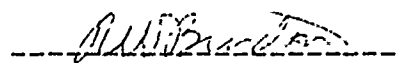
ATTN: Mr. Bill Hayden

ab Number:	88082194	88082195
ample No.:	DANGB-3-MW30-SS2	DANGB-3-MW30-SS3
ate Sampled:	08-30-88	08-30-88
ime Sampled:	11:24	11:30
ate Extracted:	09-10-88	09-10-88
ate Analyzed:	10-18-88	10-18-88
ercent Moisture:	8	11

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
-Chlorophenol	330	ND	ND
-Nitrophenol	330	ND	ND
phenol	330	ND	ND
,4-Dimethylphenol	330	ND	ND
,4-Dichlorophenol	330	ND	ND
,4,6-Trichlorophenol	330	ND	ND
-Chloro-3-methylphenol	660	ND	ND
,4-Dinitrophenol	1600	ND	ND
,6-Dichlorophenol	--*	ND	ND
-Methyl-4,6-Dinitrophenol	1600	ND	ND
entachlorophenol	1600	ND	ND
-Nitrophenol	1600	ND	ND
enzoic Acid	1600	ND	ND
-Methylphenol	330	ND	ND
- & 4-Methylphenol	330	ND	ND
,3,4,6-Tetrachlorophenol	--*	ND	ND
,4,5-Trichlorophenol	330	ND	ND



Analyst



Laboratory Supervisor

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

page 1 of 5

Date Received: August 31, 1988
Date Reported: December 7, 1988

Work Order: 932
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082196	88082197
Sample No.:	DANGB-3-MW29-SS1	DANGB-3-MW29-SS2
Date Sampled:	08-30-88	08-30-88
Time Sampled:	09:40	09:55
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-20-88	10-20-88
Percent Moisture:	10	10

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
1,3-Dichlorobenzene	330	ND	ND
1,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Bis(2-chloroethyl)ether	330	ND	ND
1,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Bis(2-chloroisopropyl)ether	330	ND	ND
N-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
Nitrobenzene	330	ND	ND
Isophorone	330	ND	ND
Naphthalene	330	ND	ND
Bis(2-chloroethoxy)methane	330	ND	ND
2-Chloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
Acenaphthylene	330	ND	ND
Acenaphthene	330	ND	ND
Dimethyl phthalate	330	ND	ND
2,6-Dinitrotoluene	330	ND	ND
Fluorene	330	ND	ND
2,4-Dinitrotoluene	330	ND	ND
Diethyl phthalate	330	ND	ND
N-Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

3 = Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

page 2 of 5

ate Received: August 31, 1988
ate Reported: December 7, 1988

Work Order: 932
Job Number: OR001

JR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

ab Number:	88082196	88082197
ample No.:	DANGB-3-MW29-SS1	DANGB-3-MW29-SS2
ate Sampled:	08-30-88	08-30-88
ime Sampled:	09:40	09:55
ate Extracted:	09-10-88	09-10-88
ate Analyzed:	10-20-88	10-20-88
ercent Moisture:	10	10

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
benanthrene	330	ND	ND
anthracene	330	ND	ND
ibutyl phthalate	330	ND	ND
luoranthene	330	ND	ND
-Chlorophenyl phenyl ether	330	ND	ND
yrene	330	ND	ND
utyl Benzyl phthalate	330	ND	ND
is(2-ethylhexyl) phthalate	330	ND	ND
hrysene	330	ND	ND
-Bromophenyl phenyl ether	330	ND	ND
enzo(a)anthracene	330	ND	ND
i-n-octylphthalate	330	ND	ND
enzo(b)fluoranthene	330	ND	ND
enzo(k)fluoranthene	330	ND	ND
enzidine	2000	ND	ND
,3'-Dichlorobenzidine	660	ND	ND
enzo(a)pyrene	330	ND	ND
ndeno(1,2,3-cd)pyrene	330	ND	ND
ibenzo(a,h)anthracene	330	ND	ND
enzo(ghi)perylene	330	ND	ND
enzyl Alcohol	660	ND	ND

= Compound was detected in the blank.

Base Neutrals - SW 8270

Matrix: Soil

(continued)

Date Received: August 31, 1988
 Date Reported: December 7, 1988

Work Order: 932
 Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB
 Address: 710 S. Illinois Ave, Suite F-103
 Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082196	88082197
Sample No.:	DANGB-3-MW29-SS1	DANGB-3-MW29-SS2
Date Sampled:	08-30-88	08-30-88
Time Sampled:	09:40	09:55
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-20-88	10-20-88
Percent Moisture:	10	10

Compound	Detection Limits	Analytical Results	
		(dry weight)	
	ug/kg	ug/kg	ug/kg
Acetophenone	---	ND	ND
Aniline	---	ND	ND
4-Aminobiphenyl	---	ND	ND
2-Chloroaniline	660	ND	ND
1-Chloronaphthalene	---	ND	ND
Dibenzofuran	330	ND	ND
2,6-Dimethylaminoazobenzene	---	ND	ND
1,12-Dimethylbenz(a)anthracene	---	ND	ND
1,1'-Dimethylphenethylamine	---	ND	ND
Diphenylamine	---	ND	ND
1,2-Diphenylhydrazine	---	ND	ND
Ethyl methanesulfonate	---	ND	ND
3-Methylcholanthrene	---	ND	ND
Ethyl methanesulfonate	---	ND	ND
1-Methylnaphthalene	330	ND	ND
1-Naphthylamine	---	ND	ND
2-Naphthylamine	---	ND	ND
3-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
N-Nitroso-di-n-butylamine	---	ND	ND
N-Nitrosopiperidine	---	ND	ND
Pentachlorobenzene	---	ND	ND
Pentachloronitrobenzene	---	ND	ND
Phenacetin	---	ND	ND
2-Picoline	---	ND	ND
Pronamide	---	ND	ND
1,2,4,5-Tetrachlorobenzene	---	ND	ND

EPA has not yet determined detection limits for these compounds.

3 = Compound was detected in the blank.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

page 4 of 5

Date Received: August 31, 1988
Date Reported: December 7, 1988

Work Order: 932
Job Number: OR001

DR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082196	88082197
Sample No.:	DANGB-3-MW29-SS1	DANGB-3-MW29-SS2
Date Sampled:	08-30-88	08-30-88
Time Sampled:	09:40	09:55
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-20-88	10-20-88
Percent Moisture:	10	10

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
alpha-BHC	--*	ND	ND
gamma-BHC	--*	ND	ND
delta-BHC	660	ND	ND
gamma-chlor	330	ND	ND
delta-BHC	500	ND	ND
lindrin	330	ND	ND
gamma-chlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
lindrin	500	ND	ND
1,4'-DDE	1000	ND	ND
lindrin	--*	ND	ND
Endosulfan II	--*	ND	ND
1,4'-DDD	500	ND	ND
1,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
lindrin aldehyde	--*	ND	ND
lindrin Ketone	--*	ND	ND
Alodane	2000	ND	ND
methoxychlor	--*	ND	ND
oxyphenol	2000	ND	ND
rochlor-1016	2000	ND	ND
rochlor-1221	2000	ND	ND
rochlor-1232	2000	ND	ND
rochlor-1242	2000	ND	ND
rochlor-1248	2000	ND	ND
rochlor-1254	2000	ND	ND
rochlor-1260	2000	ND	ND

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

page 5 of 5

Date Received: August 31, 1988
Date Reported: December 7, 1988

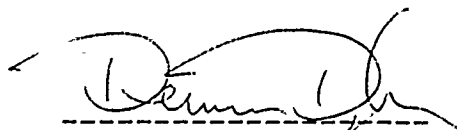
Work Order: 932
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

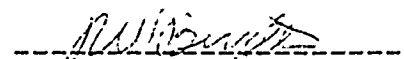
ATTN: Mr. Bill Hayden

Lab Number:	88082196	88082197
Sample No.:	DANGB-3-MW29-SS1	DANGB-3-MW29-SS2
Date Sampled:	08-30-88	08-30-88
Time Sampled:	09:40	09:55
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-20-88	10-20-88
Percent Moisture:	10	10

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
2-Chlorophenol	330	ND	ND
2-Nitrophenol	330	ND	ND
Phenol	330	ND	ND
2,4-Dimethylphenol	330	ND	ND
2,4-Dichlorophenol	330	ND	ND
2,4,6-Trichlorophenol	330	ND	ND
2-Chloro-3-methylphenol	660	ND	ND
2,4-Dinitrophenol	1600	ND	ND
2,6-Dichlorophenol	--*	ND	ND
3-Methyl-4,6-Dinitrophenol	1600	ND	ND
Pentachlorophenol	1600	ND	ND
4-Nitrophenol	1600	ND	ND
Benzoic Acid	1600	ND	ND
3-Methylphenol	330	ND	ND
3- & 4-Methylphenol	330	ND	ND
2,3,4,6-Tetrachlorophenol	--*	ND	ND
2,4,5-Trichlorophenol	330	ND	ND



Analyst



Laboratory Supervisor

EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

page 1 of 5

Date Received: August 31, 1988
Date Reported: December 7, 1988

Work Order: 932
Job Number: OR001

DR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082198	88082199
Sample No.:	DANGB-3-MW29-SS3	DANGB-3-MW29-SS3A
Date Sampled:	08-30-88	08-30-88
Time Sampled:	10:00	10:07
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	11-30-88	10-18-88
Percent Moisture:	11	13

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
1,3-Dichlorobenzene	330	ND	ND
1,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Diis(2-chloroethyl)ether	330	ND	ND
1,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Diis(2-chloroisopropyl)ether	330	ND	ND
N-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
Chlorobenzene	330	ND	ND
Sophorone	330	ND	ND
Naphthalene	330	ND	ND
Diis(2-chloroethoxy)methane	330	ND	ND
1-Chloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
1-Naphthylene	330	ND	ND
1-Naphthene	330	ND	ND
Dimethyl phthalate	330	ND	ND
1,6-Dinitrotoluene	330	ND	ND
1-Toluene	330	ND	ND
1,4-Dinitrotoluene	330	ND	ND
Diethyl phthalate	330	ND	ND
N-Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

= Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

page 2 of 5

Date Received: August 31, 1988
Date Reported: December 7, 1988

Work Order: 932
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082198	88082199
Sample No.:	DANGB-3-MW29-SS3	DANGB-3-MW29-SS3A
Date Sampled:	08-30-88	08-30-88
Time Sampled:	10:00	10:07
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	11-30-88	10-18-88
Percent Moisture:	11	13

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Di-n-butyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Di-n-butyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
2-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benzidine	2000	ND	ND
2,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

= Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Page 3 of 5

Date Received: August 31, 1988
Date Reported: December 7, 1988

Work Order: 932
Job Number: OR001

From: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082198	88082199
Sample No.:	DANGB-3-MW29-SS3	DANGB-3-MW29-SS3A
Date Sampled:	08-30-88	08-30-88
Time Sampled:	10:00	10:07
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	11-30-88	10-18-88
Percent Moisture:	11	13

Compound	Detection Limits ug/kg	Analytical Results (dry weight)	
		ug/kg	ug/kg
Acetophenone	--*	ND	ND
Aniline	--*	ND	ND
-Aminobiphenyl	--*	ND	ND
-Chloroaniline	660	ND	ND
-Chloronaphthalene	--*	ND	ND
Benzenofuran	330	ND	ND
-Dimethylaminoazobenzene	--*	ND	ND
,12-Dimethylbenz(a)anthracene	--*	ND	ND
-,a-Dimethylphenethylamine	--*	ND	ND
iphenylamine	--*	ND	ND
,2-Diphenylhydrazine	--*	ND	ND
thyl methanesulfonate	--*	ND	ND
-Methylcholanthrene	--*	ND	ND
ethyl methanesulfonate	--*	ND	ND
-Methylnaphthalene	330	ND	ND
-Naphthylamine	--*	ND	ND
-Naphthylamine	--*	ND	ND
-Nitroaniline	1600	ND	ND
-Nitroaniline	1600	ND	ND
-Nitroaniline	1600	ND	ND
-Nitroso-di-n-butylamine	--*	ND	ND
-Nitrosopiperidine	--*	ND	ND
entachlorobenzene	--*	ND	ND
entachloronitrobenzene	--*	ND	ND
enacetin	--*	ND	ND
-Picoline	--*	ND	ND
ronamide	--*	ND	ND
,2,4,5-Tetrachlorobenzene	--*	ND	ND

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

page 4 of 5

Date Received: August 31, 1988
Date Reported: December 7, 1988

Work Order: 932
Job Number: OR001

OR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082198	88082199
Sample No.:	DANGB-3-MW29-SS3	DANGB-3-MW29-SS3A
Date Sampled:	08-30-88	08-30-88
Time Sampled:	10:00	10:07
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	11-30-88	10-18-88
Percent Moisture:	11	13

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
alpha-BHC	--*	ND	ND
gamma-BHC	--*	ND	ND
Beta-BHC	660	ND	ND
heptachlor	330	ND	ND
delta-BHC	500	ND	ND
Aldrin	330	ND	ND
heptachlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
Dieldrin	500	ND	ND
4,4'-DDE	1000	ND	ND
Endrin	--*	ND	ND
Endosulfan II	--*	ND	ND
4,4'-DDD	500	ND	ND
4,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	--*	ND	ND
Endrin Ketone	--*	ND	ND
Chlordane	2000	ND	ND
Methoxychlor	--*	ND	ND
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1248	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

EPA has not yet determined detection limits for these compounds.

3 = Compound was detected in the blank.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

page 5 of 5

ate Received: August 31, 1988
ate Reported: December 7, 1988

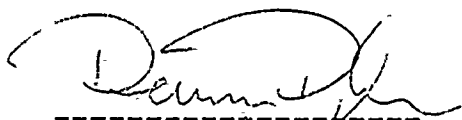
Work Order: 932
Job Number: OR001

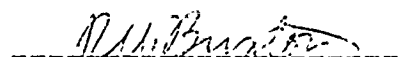
OR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

ab Number:	88082198	88082199
ample No.:	DANGB-3-MW29-SS3	DANGB-3-MW29-SS3A
ate Sampled:	08-30-88	08-30-88
ime Sampled:	10:00	10:07
ate Extracted:	09-10-88	09-10-88
ate Analyzed:	11-30-88	10-18-88
ercent Moisture:	11	13

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
-Chlorophenol	330	ND	ND
-Nitrophenol	330	ND	ND
henol	330	ND	ND
,4-Dimethylphenol	330	ND	ND
,4-Dichlorophenol	330	ND	ND
,4,6-Trichlorophenol	330	ND	ND
-Chloro-3-methylphenol	660	ND	ND
,4-Dinitrophenol	1600	ND	ND
,6-Dichlorophenol	--*	ND	ND
-Methyl-4,6-Dinitrophenol	1600	ND	ND
entachlorophenol	1600	ND	ND
-Nitrophenol	1600	ND	ND
enzoic Acid	1600	ND	ND
-Methylphenol	330	ND	ND
- & 4-Methylphenol	330	ND	ND
,3,4,6-Tetrachlorophenol	--*	ND	ND
,4,5-Trichlorophenol	330	ND	ND


Analyst


Laboratory Supervisor

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

OTE: Samples are discarded 30 days after results are rep. mess
other arrangements are made. Hazardous samples wil sturned
to client or disposed of at client expense.

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

page 1 of 5

Date Received: August 31, 1988
Date Reported: December 7, 1988

Work Order: 932
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave., Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082200	88082201
Sample No.:	DANGB-3SG-D3-SS1	DANGB-3SG-D3-SS1A
Date Sampled:	08-31-88	08-31-88
Time Sampled:	11:55	11:58
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-19-88	10-19-88
Percent Moisture:	8	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
1,3-Dichlorobenzene	330	ND	ND
1,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Bis(2-chloroethyl)ether	330	ND	ND
1,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Bis(2-chloroisopropyl)ether	330	ND	ND
N-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
Nitrobenzene	330	ND	ND
Sophorone	330	ND	ND
Naphthalene	330	ND	ND
Bis(2-chloroethoxy)methane	330	ND	ND
1-Chloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
Acenaphthylene	330	ND	ND
Acenaphthene	330	ND	ND
Dimethyl phthalate	330	ND	ND
2,6-Dinitrotoluene	330	ND	ND
Fluorene	330	ND	ND
1,4-Dinitrotoluene	330	ND	ND
Diethyl phthalate	330	ND	540
N-Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

ND = Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

page 2 of 5

Date Received: August 31, 1988
Date Reported: December 7, 1988

Work Order: 932
Job Number: OR001

DR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082200	88082201
Sample No.:	DANGB-3SG-D3-SS1	DANGB-3SG-D3-SS1A
Date Sampled:	08-31-88	08-31-88
Time Sampled:	11:55	11:58
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-19-88	10-19-88
Percent Moisture:	8	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
benzanthrene	330	ND	ND
anthracene	330	ND	ND
isobutyl phthalate	330	ND	ND
fluoranthene	330	ND	ND
2-Chlorophenyl phenyl ether	330	ND	ND
pyrene	330	ND	ND
isobutyl Benzyl phthalate	330	ND	ND
diis(2-ethylhexyl) phthalate	330	ND	ND
benzofluoranthene	330	ND	ND
2-Bromophenyl phenyl ether	330	ND	ND
benzo(a)anthracene	330	ND	ND
di-n-octylphthalate	330	ND	ND
benzo(b)fluoranthene	330	ND	ND
benzo(k)fluoranthene	330	ND	ND
benzimidazole	2000	ND	ND
2,3'-Dichlorobenzidine	660	ND	ND
benzo(a)pyrene	330	ND	ND
benz(a,b)pyrene	330	ND	ND
benzo(a,h)anthracene	330	ND	ND
benzo(ghi)perylene	330	ND	ND
benzyl Alcohol	660	ND	ND

= Compound was detected in the blank.

Base Neutrals - SW 8270

Matrix: Soil

(continued)

Date Received: August 31, 1988
 Date Reported: December 7, 1988

Work Order: 932
 Job Number: OR001

For: ES:Oak Ridge/Duluth ANGB
 Address: 710 S. Illinois Ave, Suite F-103
 Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082200	88082201
Sample No.:	DANGB-3SG-D3-SS1	DANGB-3SG-D3-SS1A
Date Sampled:	08-31-88	08-31-88
Time Sampled:	11:55	11:58
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-19-88	10-19-88
Percent Moisture:	8	8

Compound	Detection Limits ug/kg	Analytical Results (dry weight)	
		ug/kg	ug/kg
acetophenone	---	ND	ND
aniline	---	ND	ND
4-Aminobiphenyl	---	ND	ND
1-Chloroaniline	660	ND	ND
1-Chloronaphthalene	---	ND	ND
Dibenzofuran	330	ND	ND
1-Dimethylaminoazobenzene	---	ND	ND
1,12-Dimethylbenz(a)anthracene	---	ND	ND
1,1'-Dimethylphenethylamine	---	ND	ND
Diphenylamine	---	ND	ND
1,2-Diphenylhydrazine	---	ND	ND
Ethyl methanesulfonate	---	ND	ND
3-Methylcholanthrene	---	ND	ND
Ethyl methanesulfonate	---	ND	ND
1-Methylnaphthalene	330	ND	ND
1-Naphthylamine	---	ND	ND
2-Naphthylamine	---	ND	ND
1-Nitroaniline	1600	ND	ND
3-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
1-Nitroso-di-n-butylamine	---	ND	ND
1-Nitrosopiperidine	---	ND	ND
Pentachlorobenzene	---	ND	ND
1-Pentachloronitrobenzene	---	ND	ND
Phenacetin	---	ND	ND
2-Picoline	---	ND	ND
Pronamide	---	ND	ND
1,2,4,5-Tetrachlorobenzene	---	ND	ND

EPA has not yet determined detection limits for these compounds.

--- = Compound was detected in the blank.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

page 4 of 5

Date Received: August 31, 1988
Date Reported: December 7, 1988

Work Order: 932
Job Number: OR001

Location: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082200	88082201
Sample No.:	DANGB-3SG-D3-SS1	DANGB-3SG-D3-SS1A
Date Sampled:	08-31-88	08-31-88
Time Sampled:	11:55	11:58
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-19-88	10-19-88
Percent Moisture:	8	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
alpha-BHC	--*	ND	ND
gamma-BHC	--*	ND	ND
delta-BHC	660	ND	ND
gamma-chlor	330	ND	ND
delta-BHC	500	ND	ND
lindrin	330	ND	ND
gamma-chlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
ieldrin	500	ND	ND
,4'-DDE	1000	ND	ND
ndrin	--*	ND	ND
Endosulfan II	--*	ND	ND
,4'-DDD	500	ND	ND
,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
ndrin aldehyde	--*	ND	ND
ndrin Ketone	--*	ND	ND
lindane	2000	ND	ND
gamma-chlor	--*	ND	ND
oxaphene	2000	ND	ND
roclor-1016	2000	ND	ND
roclor-1221	2000	ND	ND
roclor-1232	2000	ND	ND
roclor-1242	2000	ND	ND
roclor-1248	2000	ND	ND
roclor-1254	2000	ND	ND
roclor-1260	2000	ND	ND

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

page 5 of 5

Date Received: August 31, 1988
Date Reported: December 7, 1988

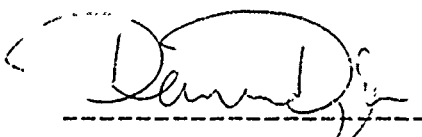
Work Order: 932
Job Number: OR001

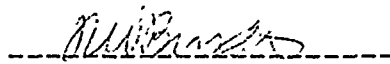
FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082200	88082201
Sample No.:	DANGB-3SG-D3-SS1	DANGB-3SG-D3-SS1A
Date Sampled:	08-31-88	08-31-88
Time Sampled:	11:55	11:58
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-19-88	10-19-88
Percent Moisture:	8	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
2-Chlorophenol	330	ND	ND
2-Nitrophenol	330	ND	ND
Phenol	330	ND	ND
2,4-Dimethylphenol	330	ND	ND
2,4-Dichlorophenol	330	ND	ND
2,4,6-Trichlorophenol	330	ND	ND
4-Chloro-3-methylphenol	660	ND	ND
2,4-Dinitrophenol	1600	ND	ND
2,6-Dichlorophenol	--*	ND	ND
4-Methyl-4,6-Dinitrophenol	1600	ND	ND
Pentachlorophenol	1600	ND	ND
4-Nitrophenol	1600	ND	ND
Benzoic Acid	1600	ND	ND
2-Methylphenol	330	ND	ND
3- & 4-Methylphenol	330	ND	ND
2,3,4,6-Tetrachlorophenol	--*	ND	ND
2,4,5-Trichlorophenol	330	ND	ND


Analyst


Laboratory Supervisor

EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

page 1 of 5

Date Received: August 31, 1988
Date Reported: December 7, 1988

Work Order: 932
Job Number: OR001

DR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082202	88082203
Sample No.:	DANGB-3SG-E3-SS1	DANGB-3SG-E3-SS1A
Date Sampled:	08-31-88	08-31-88
Time Sampled:	12:00	12:00
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-19-88	11-23-88
Percent Moisture:	10	9

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
1,3-Dichlorobenzene	330	ND	ND
1,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Bis(2-chloroethyl)ether	330	ND	ND
1,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Bis(2-chloroisopropyl)ether	330	ND	ND
N-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
Benzene	330	ND	ND
Sophorone	330	ND	ND
Naphthalene	330	ND	ND
Bis(2-chloroethoxy)methane	330	ND	ND
1-Chloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
Benaphthylene	330	ND	ND
Benaphthene	330	ND	ND
Dimethyl phthalate	330	ND	ND
1,6-Dinitrotoluene	330	ND	ND
Toluene	330	ND	ND
1,4-Dinitrotoluene	330	ND	ND
Diethyl phthalate	330	ND	1500
N-Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

= Compound was detected in the blank.

Base Neutrals - SW 8270

Matrix: Soil

(continued)

Date Received: August 31, 1988
 Date Reported: December 7, 1988

Work Order: 932
 Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
 Address: 710 S. Illinois Ave, Suite F-103
 Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082202	88082203
Sample No.:	DANGB-3SG-E3-SS1	DANGB-3SG-E3-SS1A
Date Sampled:	08-31-88	08-31-88
Time Sampled:	12:00	12:00
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-19-88	11-23-88
Percent Moisture:	10	9

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Diethyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Diethyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
2-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benidone	2000	ND	ND
2,3'-Dichlorobenidone	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

= Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Page 3 of 5

Date Received: August 31, 1988
Date Reported: December 7, 1988

Work Order: 932
Job Number: OR001

Location: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082202	88082203
Sample No.:	DANGB-3SG-E3-SS1	DANGB-3SG-E3-SS1A
Date Sampled:	08-31-88	08-31-88
Time Sampled:	12:00	12:00
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-19-88	11-23-88
Percent Moisture:	10	9

Compound	Detection Limits ug/kg	Analytical Results (dry weight)	
		ug/kg	ug/kg
acetophenone	---	ND	ND
aniline	---	ND	ND
-Aminobiphenyl	---	ND	ND
-Chloroaniline	660	ND	ND
-Chloronaphthalene	---	ND	ND
benzofuran	330	ND	ND
-Dimethylaminoazobenzene	---	ND	ND
,12-Dimethylbenz(a)anthracene	---	ND	ND
-,a-Dimethylphenethylamine	---	ND	ND
iphenylamine	---	ND	ND
,2-Diphenylhydrazine	---	ND	ND
thyl methanesulfonate	---	ND	ND
-Methylcholanthrene	---	ND	ND
ethyl methanesulfonate	---	ND	ND
-Methylnaphthalene	330	ND	ND
-Naphthylamine	---	ND	ND
-Naphthylamine	---	ND	ND
-Nitroaniline	1600	ND	ND
-Nitroaniline	1600	ND	ND
-Nitroaniline	1600	ND	ND
-Nitroso-di-n-butylamine	---	ND	ND
-Nitrosopiperidine	---	ND	ND
entachlorobenzene	---	ND	ND
entachloronitrobenzene	---	ND	ND
phenacetin	---	ND	ND
-Picoline	---	ND	ND
ronamide	---	ND	ND
,2,4,5-Tetrachlorobenzene	---	ND	ND

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

page 4 of 5

Date Received: August 31, 1988
Date Reported: December 7, 1988

Work Order: 932
Job Number: OR001

OR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88082202	88082203
Sample No.:	DANGB-3SG-E3-SS1	DANGB-3SG-E3-SS1A
Date Sampled:	08-31-88	08-31-88
Time Sampled:	12:00	12:00
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-19-88	11-23-88
Percent Moisture:	10	9

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Alpha-BHC	--*	ND	ND
Gamma-BHC	--*	ND	ND
Beta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Aldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
Dieldrin	500	ND	ND
4,4'-DDE	1000	ND	ND
Endrin	--*	ND	ND
Endosulfan II	--*	ND	ND
4,4'-DDD	500	ND	ND
4,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	--*	ND	ND
Endrin Ketone	--*	ND	ND
Chlordane	2000	ND	ND
Methoxychlor	--*	ND	ND
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1248	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

page 5 of 5

Date Received: August 31, 1988
Date Reported: December 7, 1988

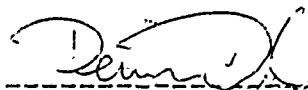
Work Order: 932
Job Number: OR001

DR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

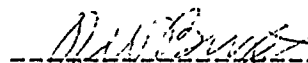
ATTN: Mr. Bill Hayden

Lab Number:	88082202	88082203
Sample No.:	DANGB-3SG-E3-SS1	DANGB-3SG-E3-SS1A
Date Sampled:	08-31-88	08-31-88
Time Sampled:	12:00	12:00
Date Extracted:	09-10-88	09-10-88
Date Analyzed:	10-19-88	11-23-88
Percent Moisture:	10	9

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
-Chlorophenol	330	ND	ND
-Nitrophenol	330	ND	ND
phenol	330	ND	ND
,4-Dimethylphenol	330	ND	ND
,4-Dichlorophenol	330	ND	ND
,4,6-Trichlorophenol	330	ND	ND
-Chloro-3-methylphenol	660	ND	ND
,4-Dinitrophenol	1600	ND	ND
,6-Dichlorophenol	--*	ND	ND
-Methyl-4,6-Dinitrophenol	1600	ND	ND
pentachlorophenol	1600	ND	ND
-Nitrophenol	1600	ND	ND
benzoic Acid	1600	ND	ND
-Methylphenol	330	ND	ND
- & 4-Methylphenol	330	ND	ND
,3,4,6-Tetrachlorophenol	--*	ND	ND
,4,5-Trichlorophenol	330	ND	ND



Analyst



Laboratory Supervisor

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

SEMI-VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Blank

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 932 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: 88082192-2203 B

Sample wt/vol: 30 (g/mL) g Lab File ID: E5923

Level: (low/med) low Date Received: _____

% Moisture: not dec. Ø dec. _____ Date Extracted: 9-10-88

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 10/20/88

GPC Cleanup: (Y/N) N pH: _____ Dilution Factor: 1

Number TICs found: 8

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	<u>unknown</u>	<u>4.55</u>	<u>530</u>	
2.		<u>5.04</u>	<u>13000</u>	
3.		<u>6.24</u>	<u>230</u>	
4.		<u>23.96</u>	<u>600</u>	
5.		<u>28.70</u>	<u>1300</u>	
6.		<u>28.78</u>	<u>770</u>	
7.		<u>33.14</u>	<u>710</u>	
8.		<u>35.46</u>	<u>900</u>	
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IF
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

Lab Name: Engineering Science

Contract: _____

DANGB-3-mw30
SS1

Lab Code: _____ Case No.: 932 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil

Lab Sample ID: 88082192

Sample wt/vol: 30 (g/mL) g

Lab File ID: E5913

Level: (low/med) low

Date Received: 8-31-88

% Moisture: not dec. 21.8 8 dec. _____

Date Extracted: 9-10-88

Extraction: (SepF/Cont/Sonc) Sonc

Date Analyzed: 10/19/88

GPC Cleanup: (Y/N) N pH: _____

Dilution Factor: 1

Number TICs found: 22

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	<u>unknown</u>	<u>4.21</u>	<u>800</u>	
2.		<u>4.61</u>	<u>870</u>	
3.		<u>5.08</u>	<u>18000</u>	
4.		<u>6.16</u>	<u>220</u>	
5.		<u>6.31</u>	<u>510</u>	
6.		<u>6.49</u>	<u>140</u>	
7.		<u>6.86</u>	<u>140</u>	
8.		<u>24.09</u>	<u>4000</u>	
9.		<u>26.18</u>	<u>180</u>	
10.		<u>26.45</u>	<u>720</u>	
11.		<u>26.68</u>	<u>250</u>	
12.		<u>28.77</u>	<u>4000</u>	
13.		<u>29.90</u>	<u>940</u>	
14.		<u>30.55</u>	<u>180</u>	
15.		<u>30.63</u>	<u>360</u>	
16.		<u>30.89</u>	<u>250</u>	
17.		<u>32.86</u>	<u>250</u>	
18.		<u>33.25</u>	<u>5800</u>	
19.		<u>35.74</u>	<u>22000</u>	
20.		<u>37.22</u>	<u>180</u>	
21.		<u>39.24</u>	<u>220</u>	
22.		<u>42.04</u>	<u>180</u>	
23.				
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1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

DANG8.3-MW30

S51A

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 932 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil

Lab Sample ID: 88092193 REMAL

Sample wt/vol: 30 (g/mL) gm

Lab File ID: E6353

Level: (low/med) low

Date Received: 8-31-88

% Moisture: not dec. 57.8 ^{DDO} _{8/23/88} dec. _____

Date Extracted: 9-10-88

Extraction: (SepF/Cont/Sonc) Sonc

Date Analyzed: 11/30/88

GPC Cleanup: (Y/N) N pH: _____

Dilution Factor: 1

Number TICs found: _____

CONCENTRATION UNITS:
(ug/L or ug/Kg): ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	<u>unknown</u>	<u>3.23</u>	<u>500</u>	
2.		<u>3.36</u>	<u>610</u>	
3.		<u>4.08</u>	<u>8300</u>	
4.		<u>4.19</u>	<u>830</u>	
5.		<u>4.73</u>	<u>4300</u>	
6.		<u>5.65</u>	<u>180</u>	
7.	<u>79-34-5</u>	<u>5.88</u>	<u>180</u>	
8.	<u>57-10-3</u>	<u>23.60</u>	<u>1500</u>	
9.	<u>unknown phthalate</u>	<u>28.16</u>	<u>150</u>	
10.	<u>unknown</u>	<u>28.24</u>	<u>1400</u>	
11.	<u>unknown phthalate</u>	<u>30.13</u>	<u>310</u>	
12.	<u>unknown</u>	<u>36.19</u>	<u>180</u>	
13.		<u>31.22</u>	<u>180</u>	
14.		<u>32.53</u>	<u>140</u>	
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FORM I SV-TIC

1/87 Rev.

3125

IF
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

DA-NGB-3-mw30-

552

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 932 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: 88082194

Sample wt/vol: 30 (g/mL) g Lab File ID: E5901

Level: (low/med) low Date Received: 8-31-88

% Moisture: not dec. 82 ²⁰⁰¹⁵ dec. _____ Date Extracted: 9-10-88

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 10/18/88

GPC Cleanup: (Y/N) N pH: _____ Dilution Factor: 1

Number TICs found: 8

CONCENTRATION UNITS:

(ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. <u>127-18-4</u>	<u>tetrachloroethene</u>	<u>4.44</u>	<u>210</u>	
2.	<u>unknown</u>	<u>4.60</u>	<u>180</u>	
3.		<u>4.75</u>	<u>440</u>	
4.		<u>4.85</u>	<u>1300</u>	
5.		<u>5.24</u>	<u>13000</u>	
6.		<u>6.36</u>	<u>510</u>	
7.		<u>28.72</u>	<u>400</u>	
8.		<u>35.69</u>	<u>8000</u>	
9.				
10.				
11.				
12.				
13.				
14.				
15.				
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SEMI-VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

DAN 68-3 m. 130-
553

Lab Name: Engineering Science Contract: _____
Lab Code: _____ Case No.: 932 SAS No.: _____ SDG No.: _____
Matrix: (soil/water) Soil Lab Sample ID: 880821965
Sample wt/vol: 30 (g/mL) g Lab File ID: E5902
Level: (low/med) low Date Received: 8-31-88
% Moisture: not dec. 9.6 dec. _____ Date Extracted: 9-10-88
Extraction: (Sep F/Cent/Sonc) Sonc Date Analyzed: 10/18/88
GPC Cleanup: (Y/N) N pH: _____ Dilution Factor: 1

Number TICs found: 11

CONCENTRATION UNITS:
(ug/L or ug/kg) ug/kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	<u>unknown</u>	<u>4.47</u>	<u>180</u>	
2.		<u>4.68</u>	<u>420</u>	
3.		<u>5.13</u>	<u>11,000</u>	
4.		<u>6.35</u>	<u>280</u>	
5.		<u>6.89</u>	<u>180</u>	
6.	<u>57-10-3</u> <u>hexadecanoic acid</u>	<u>24.05</u>	<u>1300</u>	
7.	<u>unknown</u>	<u>26.45</u>	<u>420</u>	
8.		<u>29.16</u>	<u>640</u>	
9.		<u>31.09</u>	<u>280</u>	
10.		<u>33.19</u>	<u>1200</u>	
11.		<u>35.71</u>	<u>10,000</u>	
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IF
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

Lab Name: Engineering Science Contract: _____

DAN 6B-3-
MW29-551

Lab Code: _____ Case No.: 932 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: 88082196

Sample wt/vol: 30 (g/mL) g Lab File ID: E5918

Level: (low/med) low Date Received: 8-31-88

% Moisture: not dec. 9.6 10 dec. _____ Date Extracted: 9-10-88

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 10/20/88

GPC Cleanup: (Y/N) N pH: _____ Dilution Factor: 1

Number TICs found: 16

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	<u>unknown</u>	<u>4.36</u>	<u>18000</u>	
2.		<u>4.42</u>	<u>280</u>	
3.		<u>4.49</u>	<u>260</u>	
4.		<u>4.85</u>	<u>11000</u>	
5.		<u>4.91</u>	<u>1900</u>	
6.		<u>5.18</u>	<u>16000</u>	
7.	<u>79-34-5</u> <u>1,1,2,2-tetrachloroethane</u>	<u>6.24</u>	<u>3400</u>	
8.	<u>unknown</u>	<u>6.33</u>	<u>400</u>	
9.		<u>6.53</u>	<u>460</u>	
10.		<u>6.62</u>	<u>180</u>	
11.		<u>8.99</u>	<u>330</u>	
12.		<u>24.09</u>	<u>3000</u>	
13.		<u>26.46</u>	<u>370</u>	
14.		<u>28.78</u>	<u>1900</u>	
15.		<u>30.76</u>	<u>740</u>	
16.		<u>35.68</u>	<u>150</u>	
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SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

DANGB-3 -
MW29-552

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 932 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: 88082197

Sample wt/vol: 30 (g/mL) g Lab File ID: E5917

Level: (low/med) low Date Received: 8-31-88

% Moisture: not dec. 9.8¹⁰ dec. _____
200 9/28/88 Date Extracted: 9-10-88

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 10/20/88

GPC Cleanup: (Y/N) N pH: _____ Dilution Factor: 1

Number TICs found: 18

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	<u>unknown</u>	<u>4.37</u>	<u>8500</u>	
2.		<u>4.85</u>	<u>4800</u>	
3.		<u>4.94</u>	<u>1800</u>	
4.		<u>5.19</u>	<u>11000</u>	
5.		<u>6.23</u>	<u>1000</u>	
6.		<u>6.33</u>	<u>180</u>	
7.		<u>6.54</u>	<u>700</u>	
8.		<u>12.63</u>	<u>180</u>	
9.		<u>18.86</u>	<u>150</u>	
10.		<u>24.06</u>	<u>2800</u>	
11.		<u>26.19</u>	<u>150</u>	
12.		<u>26.45</u>	<u>520</u>	
13.		<u>26.68</u>	<u>150</u>	
14.		<u>28.76</u>	<u>3000</u>	
15.		<u>28.99</u>	<u>300</u>	
16.		<u>33.24</u>	<u>150</u>	
17.		<u>35.56</u>	<u>1200</u>	
18.		<u>39.24</u>	<u>150</u>	
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SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

DANG B-3-
mw29-553

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 932 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil

Lab Sample ID: 88092198 REANA

Sample wt/vol: 30 (g/mL) gm

Lab File ID: 50607

Level: (low/med) low

Date Received: 8-31-88

% Moisture: not dec. 11.4 ^{DDP} _{5/18/88} dec. _____

Date Extracted: 9-10-88

Extraction: (SepF/Cont/Sonc) Sonc

Date Analyzed: 11/30/88

GPC Cleanup: (Y/N) N pH: _____

Dilution Factor: 1

Number TICs found: 13

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	unknown	3.32	230	
2.	↓	3.79	1006	
3.	↓	4.69	380	
4.	<u>127-18-4</u> tetrachloroethene	5.09	260	
5.	unknown	5.35	2200	
6.	↓	5.75	12,000	
7.	↓	7.12	380	
8.	<u>57-10-3</u> hexadecanoic acid	25.80	2600	
9.	<u>57-11-4</u> octadecanoic acid	27.45	230	
10.	↓	29.74	1800	
11.	↓	31.94	230	
12.	↓	33.51	190	
13.	↓	34.65	380	
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SEMI-VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

DANB-3-
mw29-553A

Lab Name: Engineering Science Contract: _____
Lab Code: _____ Case No.: 932 SAS No.: _____ SDG No.: _____
Matrix: (soil/water) Soil Lab Sample ID: 88082199
Sample wt/vol: 30 (g/mL) g Lab File ID: E5904
Level: (low/med) low Date Received: 8-31-88
% Moisture: not dec. 12.7¹³ dec. _____ Date Extracted: 9-10-88
Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 10/18/88
GPC Cleanup: (Y/N) N pH: _____ Dilution Factor: 1

Number TICs found: 12

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	unknown	4.71	380	
2.		5.13	11000	
3.		5.16	150	
4.		6.31	500	
5.		6.86	230	
6.		6.91	150	
7.	57-10-3 hexadecanoic acid	24.05	1300	
8.	unknown decanoic acid-m.wt. 284	26.45	380	
9.	unknown	26.68	150	
10.		28.74	2200	
11.		29.14	230	
12.		33.21	690	
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SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

LAB SAMPLE NO.

Lab Name: Engineering Science Contract:
 Lab Code: Case No.: 932 SAS No.: SDG No.:
 Matrix: (soil/water) Soil Lab Sample ID: 88082200
 Sample wt/vol: 30 (g/mL) g Lab File ID: E5908
 Level: (low/med) low Date Received: 8-31-88
 % Moisture: not dec. 8 ^{12/25/88} dec. Date Extracted: 9-10-88
 Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 10/19/88
 GPC Cleanup: (Y/N) N pH: Dilution Factor: 1

Number TICs found: 20

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	<u>unknown</u>	<u>4.27</u>	<u>6500</u>	
2.		<u>4.46</u>	<u>870</u>	
3.		<u>4.64</u>	<u>690</u>	
4.		<u>4.72</u>	<u>250</u>	
5.		<u>5.12</u>	<u>21000</u>	
6.		<u>6.19</u>	<u>1000</u>	
7.		<u>6.31</u>	<u>360</u>	
8.		<u>20.6.50 7.20</u>	<u>440</u>	
9.		<u>12.47</u>	<u>180</u>	
10.		<u>18.86</u>	<u>250</u>	
11.		<u>24.10</u>	<u>3600</u>	
12.		<u>26.45</u>	<u>580</u>	
13.		<u>26.69</u>	<u>180</u>	
14.		<u>28.78</u>	<u>3300</u>	
15.		<u>28.84</u>	<u>2100</u>	
16.		<u>28.99</u>	<u>290</u>	
17.		<u>30.32</u>	<u>470</u>	
18.		<u>33.25</u>	<u>290</u>	
19.		<u>35.80</u>	<u>1600</u>	
20.		<u>36.10</u>	<u>160</u>	
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IF
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

DANGB-356-

D3-SS1A

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 932 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: 88082201

Sample wt/vol: 30 (g/mL) g Lab File ID: E5910

Level: (low/med) low Date Received: 8-31-88

% Moisture: not dec. 29.8 dec. _____ Date Extracted: 9-10-88

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 10/19/88

GPC Cleanup: (Y/N) N pH: _____ Dilution Factor: 1

Number TICs found: 21

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	<u>unknown</u>	<u>4.29</u>	<u>6200</u>	
2.		<u>4.32</u>	<u>320</u>	
3.		<u>4.69</u>	<u>360</u>	
4.		<u>4.74</u>	<u>1200</u>	
5.		<u>5.18</u>	<u>26,000</u>	
6.		<u>5.24</u>	<u>650</u>	
7.		<u>6.20</u>	<u>870</u>	
8.		<u>6.33</u>	<u>1200</u>	
9.		<u>6.53</u>	<u>830</u>	
10.		<u>24.07</u>	<u>2800</u>	
11.		<u>26.45</u>	<u>580</u>	
12.		<u>26.68</u>	<u>250</u>	
13.		<u>28.78</u>	<u>4000</u>	
14.		<u>28.83</u>	<u>2700</u>	
15.		<u>29.50</u>	<u>500</u>	
16.		<u>30.46</u>	<u>290</u>	
17.		<u>32.85</u>	<u>190</u>	
18.		<u>33.25</u>	<u>4500</u>	
19.		<u>35.77</u>	<u>18000</u>	
20.		<u>36.09</u>	<u>250</u>	
21.		<u>39.26</u>	<u>180</u>	
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SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

Lab Name: Engineering Science Contract: _____

DANGB 356-

E3-551

Lab Code: _____ Case No.: 932 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil

Lab Sample ID: 88082202

Sample wt/vol: 30 (g/mL) g

Lab File ID: E5911

Level: (low/med) low

Date Received: 8-31-88

% Moisture: not dec. 95¹⁰ dec. _____
2002/2/88

Date Extracted: 9-10-88

Extraction: (SepF/Cont/Sonc) Sonc

Date Analyzed: 10/19/88

GPC Cleanup: (Y/N) N pH: _____

Dilution Factor: 1

Number TICs found: 17

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	<u>unknown</u>	<u>4.33</u>	<u>290</u>	
2.		<u>4.62</u>	<u>480</u>	
3.		<u>5.11</u>	<u>8500</u>	
4.		<u>6.30</u>	<u>220</u>	
5.		<u>18.87</u>	<u>150</u>	
6.		<u>24.86</u>	<u>2500.</u>	
7.		<u>26.45</u>	<u>520</u>	
8.		<u>26.69</u>	<u>220</u>	
9.		<u>28.78</u>	<u>4000</u>	
10.		<u>28.84</u>	<u>2300</u>	
11.		<u>28.99</u>	<u>590</u>	
12.		<u>30.44</u>	<u>480</u>	
13.		<u>30.89</u>	<u>260</u>	
14.		<u>33.25</u>	<u>4380</u>	
15.	<u>unknown saturated hydrocarbon</u>	<u>34.71</u>	<u>160</u>	
16.	<u>unknown</u>	<u>42.05</u>	<u>670</u>	
17.	<u>unknown</u>	<u>42.05</u>	<u>210</u>	
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SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

DANGB-356-
E3-SS1A

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 932 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: 88092203

Sample wt/vol: 30 (g/mL) g Lab File ID: S0584

Level: (low/med) low Date Received: 8-31-88

% Moisture: not dec. 9 dec. _____ Date Extracted: 9-10-88

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 11-23-88

GPC Cleanup: (Y/N) N pH: _____ Dilution Factor: 1

Number TICs found: _____

CONCENTRATION UNITS:

(ug/L or ug/Kg) ug/kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	<u>unknown</u>	<u>3.37</u>	<u>950</u>	
2.		<u>3.48</u>	<u>620</u>	
3.		<u>3.59</u>	<u>170</u>	
4.		<u>3.85</u>	<u>270</u>	
5.		<u>4.60</u>	<u>480</u>	
6.		<u>4.86</u>	<u>2100</u>	
7.		<u>5.38</u>	<u>1400</u>	
8.		<u>5.97</u>	<u>8500</u>	
9.	XXXXXXXXXXXXXXXXXXXX	XXXXXXXXXXXX	XXXXXXXXXXXX	XXXX
10.	<u>unknown alkyl benzene</u>	<u>20.56</u>	<u>300</u>	
11.	<u>57-10-3 hexadecanoic acid</u>	<u>25.03</u>	<u>2600</u>	
12.	<u>unknown carboxylic acid</u>	<u>27.45</u>	<u>150</u>	
13.	<u>unknown</u>	<u>29.79</u>	<u>3000</u>	
14.		<u>34.71</u>	<u>1500</u>	
15.		<u>37.81</u>	<u>3100</u>	
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QUALITY CONTROL RESULTS SUMMARY
EPA METHOD 8270

Job No.: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: BNA-S-0048-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 8-31-88
Date Prepared: 9-10-88
Date Analyzed: 10-19-88
Date Reported: 12-13-88
Dilution Factor: NA
%Moisture: 8

Project: Duluth ANGB
Laboratory Supervisor Approval: AWB

QC Report for Laboratory Sample No(s):
88082192-88082203
88082223-88082227

Fraction	Compound	SA	SR	MS	PR	MSD	PR	RPD	EPA QC Limit RPD %Recovery
B/N Laboratory Sample # 88082200	1,2,4-Trichlorobenzene	3620	ND	1740	48	1630	45	6.4	23 38-107
	Acenaphthene	3620	ND	2500	69	1590	44	44*	19 31-137
	2,4-Dinitrotoluene	3620	ND	3910	108*	2320	64	51*	47 28-89
	Pyrene	3620	ND	2170	60	1340	37	47*	36 35-142
	N-Nitroso-di-n-Propylamine	3620	ND	3370	93	2100	58	46*	38 41-126
	1,4-Dichlorobenzene	3620	ND	1230	34	1010	28	19	27 28-104
ACID Laboratory Sample # 88082200	Pentachlorophenol	7250	ND	9780	135*	5620	78	53*	47 17-109
	Phenol	7250	ND	6810	94*	4200	58	47*	35 26-90
	2-Chlorophenol	7250	ND	5250	72	3590	50	36	50 25-102
	4-Chloro-3-Methylphenol	7250	ND	8510	117*	6120	84	32	33 26-103
	4-Nitrophenol	7250	ND	7570	104	7570	104	0	50 11-114

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY
EPA METHOD 8270

Job No.: 0R001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: BNA-S-0048-88B
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: NA
Date Prepared: 9-10-88
Date Analyzed: 10-20-88
Date Reported: 12-13-88
Dilution Factor: NA
%Moisture: NA

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88082192-88082203
88082223-88082227

[Signature]

Fraction	Compound	SA	SR	MS	PR	MSD	PR	RPD	EPA QC Limit RPD %Recovery
B/N Laboratory Sample # Blank	1,2,4-Trichlorobenzene	3330	ND	1260	38	23	1*	200*	23 38-107
	Acenaphthene	3330	ND	1710	51	1010	30*	51*	19 31-137
	2,4-Dinitrotoluene	3330	ND	2230	67	3370	101	41	47 28-89
	Pyrene	3330	ND	2250	68	3250	98	36	36 35-142
	N-Nitroso-di-n-Propylamine	3330	ND	2150	65	2030	61	6	38 41-126
	1,4-Dichlorobenzene	3330	ND	753	23*	ND	NC*	NC*	27 28-104
ACID Laboratory Sample # Blank	Pentachlorophenol	6670	ND	3700	55	8770	131*	81*	47 17-109
	Phenol	6670	ND	3470	52	2610	39	28	35 26-90
	2-Chlorophenol	6670	ND	2990	45	1210	18*	85*	50 25-102
	4-Chloro-3-Methylphenol	6670	ND	4900	73	6000	90	20	33 26-103
	4-Nitrophenol	6670	ND	5530	83	9470	142*	52*	50 11-114

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* See Case Narrative attached.

Relative Percent Difference (RPD) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample
MSD = Spike Duplicate
SR = Sample Result
SA = Spike Added (Concentration)

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
QC REPORT NO.: BNA-S-0048-88
QC REPORT NO.: BNA-S-0048-88B
WORK ORDER NO.: 932

The first analysis of samples 88082193, 88082199 and 88082203 resulted in slightly low recoveries of surrogate spikes. These extracts were re-analyzed out of the extract holding time period. Acceptable surrogate recoveries were obtained from these second analyses. The data from the second analysis are reported.

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830

Sample Matrix: Soil
 Conc. Unit: ug/KG
 Date Reported: 12-12-88

Laboratory Supervisor Approval:

Project: Duluth ANGB

[Signature]

File ID	Date Analyzed	Fraction	Instru- ment ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
E5923	10-20-88	BNA	2	-	None Detected	-	-	88082192-88082203 88082223-88082227
3129								

SEMIVOLATILE METHOD BLANK SUMMARY

4B

Job No.:

Client:

Attn:

Address:

Work Order No.:

Lab Sample No.: 03-71

Lab File ID: ES923

Matrix: soil

Level (low/med):

Date Analyzed: 10-20-88

Time Analyzed: 14:59

Instrument ID:

Date Reported:

Project:

Duluth

This Method Blank applies to the following samples, MS and MSD.

Sample Number	Lab Sample ID	Lab File ID	Date of Analysis
ANGB-3-MW30-SS1	88082192	ES913	10-19-88
MW30-SS1A	88082193	ES900, E6353	10-18-88, 11-30-88
MW30-SS2	88082194	ES901	10-18-88
MW30-SS3	88082195	ES902	10-18-88
MW29-SS1	88082196	ES918	10-20-88
MW29-SS2	88082197	ES917	10-20-88
MW29-SS3	88082198	ES903, S0607	10-18-88, 11-30-88
↓ MW29-SS3A	88082199	ES904	10-18-88
ANGB-3SG-D3 SS1	88082200	ES908	10-19-88
↓	88082200 MS	ES931, ES907	10-20-88, 10-19-88
↓	88082200 MSD	ES932, ES909	10-20-88, 10-19-88
-D3 SS1A	88082201	ES910	10-19-88
-E3 SS1	88082202	ES911	10-19-88
↓ -E3 SS1A	88082203	ES912	10-19-88
ANGB-2BH1-SS6 15-17	88082223	ES926	10-20-88
-2BH1-SS7 22-24	88082224	ES927, ES947	10-20-88, 10-22-88
-2BH2-SS4 14-15	88082225	ES928	10-20-88
-2BH2-SS5 20-22	88082226	ES929 3140	10-20-88
↓ -2BH2-SS6 24-25	88082227	ES930, ES948	10-20-88, 10-22-88
	BLANK MS	ES924	10-24-88

QUALITY CONTROL RESULTS SUMMARY
 ENVIRONMENTAL QUALITY PARAMETERS
 PETROLEUM HYDROCARBONS

TPH-S-0081-88
 Soil
 mg/KG
 8-31-88
 9-26-88
 9-27-88
 11-22-88
 8
 7.8

QC Report No:
 Sample Matrix:
 Conc. Unit:
 Date Received:
 Date Prepared:
 Date Analyzed:
 Date Reported:
 Dilution Factor:
 %Moisture:

Job No.: OR001

Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn.

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
 88082192-88082203, 88082186-88082188

[Signature]

Laboratory Sample No.	Anal Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88082192	418.1	<100	<100	1100	760	69	730	66	4	*
Blank	418.1	<100	<100	1000	700	70	800	80	13	*

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

* Percent recovery and relative percent difference are within ES Laboratory limits for matrix spike and blank spike.

$$\text{Relative Percent Difference (RPD)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

NA = Not Applicable
 NC = Not Calculated
 ND = Not Detected

$$\text{Percent Recovery (PR)} = \frac{\text{SSR} - \text{SR} \times 100}{\text{SA}}$$

SR = Sample Result
 SA = Spike Added (Concentration)

QUALITY CONTROL RESULTS SUMMARY
ENVIRONMENTAL QUALITY PARAMETERS
PETROLEUM HYDROCARBONS

Job No.:

OR001

Client:

ES Oak Ridge

Attn:

Bill Hayden

Address:

710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn.

TPH-S-0081-88

QC Report No:

Soil

Sample Matrix:

mg/KG

Conc. Unit:

8-31-88

Date Received:

9-26-88

Date Prepared:

9-27-88

Date Analyzed:

11-22-88

Date Reported:

8

Dilution Factor:

%Moisture: 7.8

Project:

Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):

88082192-88082203, 88082186-88082188

[Signature]

Laboratory Sample No.	Anal. Method	Blank	SR	SA	MS	PR	MSD	PR	RPD	Notes
88082192	418.1	<100	<100	1100	760	69	730	66	4	*
Blank	418.1	<100	<100	1000	700	70	800	80	13	*

3142

NOTE: If % moisture is reported, results are presented on a dry-weight basis.

* Percent recovery and relative percent difference are within ES Laboratory limits for matrix spike and blank spike.

$$\text{Relative Percent Difference (RPD)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

MS = Spike Sample
MSD = Spike Duplicate

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

$$\text{Percent Recovery (PR)} = \frac{\text{SSR} - \text{SR}}{\text{SA}} \times 100$$

SR = Sample Result
SA = Spike Added (Concentration)

DATA PACKAGE #61

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ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

page 1 of 3

Date Received: August 16, 1988
Date Reported: October 25, 1988

Work Order: 856
Job Number: 0R001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081883	88081884
Sample No.:	DANGB2-MW37-SS1	DANGB2-MW37-SS2
Date Sampled:	8-15-88	8-15-88
Time Sampled:	12:55	13:28
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-01-88
Percent Moisture:	14	11

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
1,3-Dichlorobenzene	330	ND	ND
1,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Bis(2-chloroethyl)ether	330	ND	ND
1,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Bis(2-chloroisopropyl)ether	330	ND	ND
N-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
Nitrobenzene	330	ND	ND
Isophorone	330	ND	ND
Naphthalene	330	ND	ND
Bis(2-chloroethoxy)methane	330	ND	ND
2-Chloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
Acenaphthylene	330	ND	ND
Acenaphthene	330	ND	ND
Dimethyl phthalate	330	ND	ND
2,6-Dinitrotoluene	330	ND	ND
Fluorene	330	ND	ND
2,4-Dinitrotoluene	330	ND	ND
Diethyl phthalate	330	ND	ND
N-Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

page 2 of 5

Date Received: August 16, 1988
Date Reported: October 25, 1988

Work Order: 856
Job Number: 0R001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081883	88081884
Sample No.:	DANB2-MW37-SS1	DANB2-MW37-SS2
Date Sampled:	8-15-88	8-15-88
Time Sampled:	12:55	13:28
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-01-88
Percent Moisture:	14	11

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Dibutyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Butyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
4-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benzidine	2000	ND	ND
3,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

Base Neutrals - SW 8270

Matrix: Soil

(continued)

Date Received: August 16, 1988
 Date Reported: October 25, 1988

Work Order: 856
 Job Number: 0R001

For: ES:Oak Ridge/Duluth ANGB
 Address: 710 S. Illinois Ave, Suite F-103
 Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081883	88081884
Sample No.:	DANGB2-MW37-SS1	DANGB2-MW37-SS2
Date Sampled:	8-15-88	8-15-88
Time Sampled:	12:55	13:28
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-01-88
Percent Moisture:	14	11

Compound	Detection Limits ug/kg	Analytical Results (dry weight)	
		ug/kg	ug/kg
Acetophenone	---	ND	ND
Aniline	---	ND	ND
4-Aminobiphenyl	---	ND	ND
4-Chloroaniline	660	ND	ND
1-Chloronaphthalene	---	ND	ND
Dibenzofuran	330	ND	ND
p-Dimethylaminoazobenzene	---	ND	ND
7,12-Dimethylbenz(a)anthracene	---	ND	ND
a-,a-Dimethylphenethylamine	---	ND	ND
Diphenylamine	---	ND	ND
1,2-Diphenylhydrazine	---	ND	ND
Ethyl methanesulfonate	---	ND	ND
3-Methylcholanthrene	---	ND	ND
Methyl methanesulfonate	---	ND	ND
2-Methylnaphthalene	330	ND	ND
1-Naphthylamine	---	ND	ND
2-Naphthylamine	---	ND	ND
2-Nitroaniline	1600	ND	ND
3-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
N-Nitroso-di-n-butylamine	---	ND	ND
N-Nitrosopiperidine	---	ND	ND
Pentachlorobenzene	---	ND	ND
Pentachloronitrobenzene	---	ND	ND
Phenacetin	---	ND	ND
2-Picoline	---	ND	ND
Pronamide	---	ND	ND
1,2,4,5-Tetrachlorobenzene	---	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

page 4 of 5

Date Received: August 16, 1988
Date Reported: October 25, 1988

Work Order: 856
Job Number: 0R001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN:Mr. Bill Hayden

Lab Number:	88081883	88081884
Sample No.:	DANGB2-MW37-SS1	DANGB2-MW37-SS2
Date Sampled:	8-15-88	8-15-88
Time Sampled:	12:55	13:28
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-01-88
Percent Moisture:	14	11

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Alpha-BHC	--*	ND	ND
Gamma-BHC	--*	ND	ND
Beta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Aldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	*	ND	ND
Dieldrin	500	ND	ND
4,4'-DDE	1000	ND	ND
Endrin	-->	ND	ND
Endosulfan II	-->	ND	ND
4,4'-DDD	500	ND	ND
4,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	--*	ND	ND
Endrin Ketone	-->	ND	ND
Chlordane	2000	ND	ND
Mathoxychlor	--*	ND	ND
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1248	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

page 5 of 5

Date Received: August 16, 1988
Date Reported: October 25, 1988

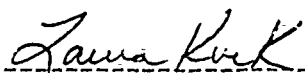
Work Order: 856
Job Number: OR001


FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081883	88081884
Sample No.:	DANGB2-MW37-SS1	DANGB2-MW37-SS2
Date Sampled:	8-15-88	8-15-88
Time Sampled:	12:55	13:28
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-01-88
Percent Moisture:	14	11

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
2-Chlorophenol	330	ND	ND
2-Nitrophenol	330	ND	ND
Phenol	330	ND	ND
2,4-Dimethylphenol	330	ND	ND
2,4-Dichlorophenol	330	ND	ND
2,4,6-Trichlorophenol	330	ND	ND
4-Chloro-3-methylphenol	660	ND	ND
2,4-Dinitrophenol	1600	ND	ND
2,6-Dichlorophenol	--*	ND	ND
2-Methyl-4,6-Dinitrophenol	1600	ND	ND
Pentachlorophenol	1600	ND	ND
4-Nitrophenol	1600	ND	ND
Benzoic Acid	1600	ND	ND
2-Methylphenol	330	ND	ND
3- & 4-Methylphenol	330	ND	ND
2,3,4,6-Tetrachlorophenol	--*	ND	ND
2,4,5-Trichlorophenol	330	ND	ND


Analyst


Laboratory Supervisor

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

page 1 of 5

Date Received: August 16, 1988
Date Reported: October 25, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081885	88081885
Sample No.:	DAN6B2-MW37-SS3	DAN6B2-MW37-SS4
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:26	13:22
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-03-88
Percent Moisture:	15	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
1,3-Dichlorobenzene	330	ND	ND
1,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Bis(2-chloroethyl)ether	330	ND	ND
1,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Bis(2-chloroisopropyl)ether	330	ND	ND
N-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
1,2,4-Trichlorobenzene	330	ND	ND
Nitrobenzene	330	ND	ND
Isophorone	330	ND	ND
Naphthalene	330	ND	ND
Bis(2-chloroethoxy)methane	330	ND	ND
2-Chloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
Acenaphthylene	330	ND	ND
Acenaphthene	330	ND	ND
Dimethyl phthalate	330	ND	ND
2,6-Dinitrotoluene	330	ND	ND
Fluorene	330	ND	ND
2,4-Dinitrotoluene	330	ND	ND
Diethyl phthalate	330	ND	ND
N-Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

page 2 of 5

Date Received: August 16, 1988
Date Reported: October 25, 1988

Work Order: 856
Job Number: 0R001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081885	88081886
Sample No.:	DANGB2-MW37-SS3	DANGB2-MW37-SS4
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:26	13:22
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-03-88
Percent Moisture:	15	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Dibutyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Butyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Chrysene	330	ND	ND
4-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
Di-n-octylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benzidine	2000	ND	ND
3,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
Dibenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Page 3 of 5

Date Received: August 16, 1988
Date Reported: October 25, 1988

Work Order 856
Job Number: 0R001

For: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081885	88081886
Sample No.:	DANGB2-MW37-SS3	DANGB2-MW37-SS4
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:26	13:22
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-03-88
Percent Moisture:	15	8

Compound	Detection Limits ug/kg	Analytical Results (dry weight)	
		ug/kg	ug/kg
Acetophenone	--*	ND	ND
Aniline	--*	ND	ND
4-Aminobiphenyl	--*	ND	ND
4-Chloroaniline	660	ND	ND
1-Chloronaphthalene	--*	ND	ND
Dibenzofuran	330	ND	ND
p-Dimethylaminoazobenzene	--*	ND	ND
7,12-Dimethylbenz(a)anthracene	--*	ND	ND
a-,a-Dimethylphenethylamine	--*	ND	ND
Diphenylamine	--*	ND	ND
1,2-Diphenylhydrazine	--*	ND	ND
Ethyl methanesulfonate	--*	ND	ND
3-Methylcholanthrene	--*	ND	ND
Methyl methanesulfonate	--*	ND	ND
2-Methylnaphthalene	330	ND	ND
1-Naphthylamine	--*	ND	ND
2-Naphthylamine	--*	ND	ND
2-Nitroaniline	1600	ND	ND
3-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
N-Nitroso-di-n-butylamine	--*	ND	ND
N-Nitrosopiperidine	--*	ND	ND
Pentachlorobenzene	--*	ND	ND
Pentachloronitrobenzene	--*	ND	ND
Phenacetin	--*	ND	ND
2-Picoline	--*	ND	ND
Pronamide	--*	ND	ND
1,2,4,5-Tetrachlorobenzene	--*	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

page 4 of 5

Date Received: August 16, 1988
Date Reported: October 25, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN:Mr. Bill Hayden

Lab Number:	88081885	88081886
Sample No.:	DANGB2-MW37-SS3	DANGB2-MW37-SS4
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:25	13:22
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-03-88
Percent Moisture:	15	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Alpha-BHC	---	ND	ND
Gamma-BHC	---	ND	ND
Beta-BHC	560	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Aldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	---	ND	ND
Dieldrin	500	ND	ND
4,4'-DDE	1000	ND	ND
Endrin	---	ND	ND
Endosulfan II	---	ND	ND
4,4'-DDD	500	ND	ND
4,4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Endrin aldehyde	---	ND	ND
Endrin Ketone	---	ND	ND
Chlordane	2000	ND	ND
Methoxychlor	---	ND	ND
Toxaphene	2000	ND	ND
Aroclor-1016	2000	ND	ND
Aroclor-1221	2000	ND	ND
Aroclor-1232	2000	ND	ND
Aroclor-1242	2000	ND	ND
Aroclor-1248	2000	ND	ND
Aroclor-1254	2000	ND	ND
Aroclor-1260	2000	ND	ND

* EPA has not yet determined detection limits for these compounds.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

page 5 of 5

Date Received: August 16, 1988
Date Reported: October 25, 1988

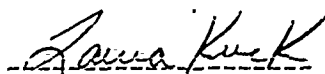
Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

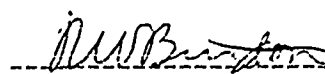
ATTN: Mr. Bill Hayden

Lab Number:	88081885	88081886
Sample No.:	DANGB2-MW37-SS3	DANGB2-MW37-SS4
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:26	13:22
Date Extracted:	8-25-88	8-25-88
Date Analyzed:	10-01-88	10-03-88
Percent Moisture:	15	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
2-Chlorophenol	330	ND	ND
2-Nitrophenol	330	ND	ND
Phenol	330	ND	ND
2,4-Dimethylphenol	330	ND	ND
2,4-Dichlorophenol	330	ND	ND
2,4,6-Trichlorophenol	330	ND	ND
4-Chloro-3-methylphenol	660	ND	ND
2,4-Dinitrophenol	1600	ND	ND
2,6-Dichlorophenol	--*	ND	ND
2-Methyl-4,6-Dinitrophenol	1600	ND	ND
Pentachlorophenol	1600	ND	ND
4-Nitrophenol	1600	ND	ND
Benzoic Acid	1600	ND	ND
2-Methylphenol	330	ND	ND
3- & 4-Methylphenol	330	ND	ND
2,3,4,6-Tetrachlorophenol	-->	ND	ND
2,4,5-Trichlorophenol	330	ND	ND



Analyst



Laboratory Supervisor

* EPA has not yet determined detection limits for these compounds.

B = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

Date Received: August 16, 1988
Date Reported: December 9, 1988

Work Order: 856
Job Number: OR001

OR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081887	88081888
Sample No.:	DANGB2-MW37-SS5	DANGB2-MW39-SS1
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:28	16:24
Date Extracted:	10-28-88	08-25-88
Date Analyzed:	11-02-88	10-03-88
Percent Moisture:	10	12

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
1,3-Dichlorobenzene	330	ND	ND
1,4-Dichlorobenzene	330	ND	ND
Hexachloroethane	330	ND	ND
Di-(2-chloroethyl)ether	330	ND	ND
1,2-Dichlorobenzene	330	ND	ND
N-Nitrosodimethylamine	330	ND	ND
Di-(2-chloroisopropyl)ether	330	ND	ND
N-Nitrosodi-n-propylamine	330	ND	ND
Hexachlorobutadiene	330	ND	ND
2,4-Trichlorobenzene	330	ND	ND
Nitrobenzene	330	ND	ND
Isophorone	330	ND	ND
Phthalene	330	ND	ND
Di-(2-chloroethoxy)methane	330	ND	ND
2-Chloronaphthalene	330	ND	ND
Hexachlorocyclopentadiene	330	ND	ND
Naphthylene	330	ND	ND
Acenaphthene	330	ND	ND
Dimethyl phthalate	330	ND	ND
2,6-Dinitrotoluene	330	ND	ND
Fluorene	330	ND	ND
2,4-Dinitrotoluene	330	ND	ND
Methyl phthalate	330	ND	ND
Nitrosodiphenylamine	330	ND	ND
Hexachlorobenzene	330	ND	ND

ND = Compound was detected in the blank.

Priority Pollutant Analysis

page 2 of 5

Base Neutrals - SW 8270

Matrix: Soil

(continued)

e Received: August 16, 1988

Work Order: 856

e Reported: December 9, 1988

Job Number: OR001

Location: ES:Oak Ridge/Duluth ANGB

ATTN: Mr. Bill Hayden

Address: 710 S. Illinois Ave, Suite F-103

Oak Ridge, TN 37830

Sample Number:	88081887	88081888
Sample No.:	DANGB2-MW37-SS5	DANGB2-MW39-SS1
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:28	16:24
Date Extracted:	10-28-88	08-25-88
Date Analyzed:	11-02-88	10-03-88
Percent Moisture:	10	12

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Benanthrene	330	ND	ND
Chracene	330	ND	ND
Butyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
Chlorophenyl phenyl ether	330	ND	ND
Phenanthrene	330	ND	ND
Diethyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Pyrene	330	ND	ND
Bromophenyl phenyl ether	330	ND	ND
Benz(a)anthracene	330	ND	ND
n-Octylphthalate	330	ND	ND
Benz(b)fluoranthene	330	ND	ND
Benz(k)fluoranthene	330	ND	ND
Acridine	2000	ND	ND
2,2'-Dichlorobenzidine	660	ND	ND
Benz(a)pyrene	330	ND	ND
Benzo(1,2,3-cd)pyrene	330	ND	ND
Benzo(a,h)anthracene	330	ND	ND
Benz(ghi)perylene	330	ND	ND
Diethyl Alcohol	660	ND	ND

* Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Page 3 of 5

Date Received: August 16, 1988
Date Reported: December 9, 1988

Work Order: 856
Job Number: OR001

From: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081887	88081888
Sample No.:	DANGB2-MW37-SS5	DANGB2-MW39-SS1
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:28	16:24
Date Extracted:	10-28-88	08-25-88
Date Analyzed:	11-02-88	10-03-88
Percent Moisture:	10	12

Compound	Detection Limits ug/kg	Analytical Results (dry weight)	
		ug/kg	ug/kg
Acetophenone	--*	ND	ND
Aniline	--*	ND	ND
4-Aminobiphenyl	--*	ND	ND
Chloroaniline	660	ND	ND
Chloronaphthalene	--*	ND	ND
Dibenzofuran	330	ND	ND
Dimethylaminoazobenzene	--*	ND	ND
12-Dimethylbenz(a)anthracene	--*	ND	ND
1,1'-Dimethylphenethylamine	--*	ND	ND
Diphenylamine	--*	ND	ND
2-Diphenylhydrazine	--*	ND	ND
Ethyl methanesulfonate	--*	ND	ND
3-Methylcholanthrene	--*	ND	ND
Ethyl methanesulfonate	--*	ND	ND
Methylnaphthalene	330	ND	ND
1-Naphthylamine	--*	ND	ND
2-Naphthylamine	--*	ND	ND
Nitroaniline	1600	ND	ND
3-Nitroaniline	1600	ND	ND
4-Nitroaniline	1600	ND	ND
Nitroso-di-n-butylamine	--*	ND	ND
Nitrosopiperidine	--*	ND	ND
Pentachlorobenzene	--*	ND	ND
Pentachloronitrobenzene	--*	ND	ND
Paracetamol	--*	ND	ND
2-Picoline	--*	ND	ND
Pronamide	--*	ND	ND
2,4,5-Tetrachlorobenzene	--*	ND	ND

EPA has not yet determined detection limits for these compounds.

--* = Compound was detected in the blank.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

page 4 of 5

Received: August 16, 1988
Reported: December 9, 1988

Work Order: 856
Job Number: OR001

ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Sample Number:	88081887	88081888
Sample No.:	DANGB2-MW37-SS5	DANGB2-MW39-SS1
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:28	16:24
Date Extracted:	10-28-88	08-25-88
Date Analyzed:	11-02-88	10-03-88
Percent Moisture:	10	12

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
alpha-BHC	--*	ND	ND
gamma-BHC	--*	ND	ND
delta-BHC	660	ND	ND
gamma-chlor	330	ND	ND
delta-BHC	500	ND	ND
gamma-chlor	330	ND	ND
gamma-chlor epoxide	330	ND	ND
gamma-chlor I	--*	ND	ND
gamma-chlor	500	ND	ND
gamma-chlor	1000	ND	ND
gamma-chlor	--*	ND	ND
gamma-chlor II	--*	ND	ND
gamma-chlor	500	ND	ND
gamma-chlor	830	ND	ND
gamma-chlor Sulfate	1000	ND	ND
gamma-chlor aldehyde	--*	ND	ND
gamma-chlor Ketone	--*	ND	ND
gamma-chlor	2000	ND	ND
gamma-chlor	--*	ND	ND
gamma-chlor	2000	ND	ND
gamma-chlor-1016	2000	ND	ND
gamma-chlor-1221	2000	ND	ND
gamma-chlor-1232	2000	ND	ND
gamma-chlor-1242	2000	ND	ND
gamma-chlor-1248	2000	ND	ND
gamma-chlor-1254	2000	ND	ND
gamma-chlor-1260	2000	ND	ND

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

page 5 of 5

Date Received: August 16, 1988
Date Reported: December 9, 1988

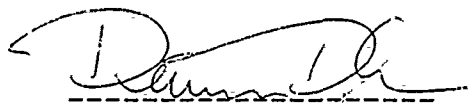
Work Order: 856
Job Number: OR001


OR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081887	88081888
Sample No.:	DANGB2-MW37-SS5	DANGB2-MW39-SS1
Date Sampled:	8-15-88	8-15-88
Time Sampled:	13:28	16:24
Date Extracted:	10-28-88	08-25-88
Date Analyzed:	11-02-88	10-03-88
Percent Moisture:	10	12

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
1-Chlorophenol	330	ND	ND
1-Nitrophenol	330	ND	ND
phenol	330	ND	ND
4-Dimethylphenol	330	ND	ND
2,4-Dichlorophenol	330	ND	ND
4,6-Trichlorophenol	330	ND	ND
Chloro-3-methylphenol	660	ND	ND
2,4-Dinitrophenol	1600	ND	ND
2,6-Dichlorophenol	--*	ND	ND
Methyl-4,6-Dinitrophenol	1600	ND	ND
Pentachlorophenol	1600	ND	ND
4-Nitrophenol	1600	ND	ND
Benzoic Acid	1600	ND	ND
Methylphenol	330	ND	ND
3- & 4-Methylphenol	330	ND	ND
3,4,6-Tetrachlorophenol	--*	ND	ND
4,5-Trichlorophenol	330	ND	ND


Analyst


Laboratory Supervisor

EPA has not yet determined detection limits for these compounds.

3 = Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

3159

ENGINEERING SCIENCE
Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil

te Received: August 16, 1988
te Reported: December 9, 1988

Work Order: 856
Job Number: OR001

ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Number:	88081889	88081890
Sample No.:	DANGB2-MW39-SS2	DANGB2-MW39-SS3
Date Sampled:	8-15-88	8-15-88
Time Sampled:	16:42	17:05
Date Extracted:	10-28-88	8-25-88
Date Analyzed:	11-02-88	10-03-88
Percent Moisture:	13	8

Compound	Detection Limits	ANALYTICAL RESULTS (dry weight)	
	ug/kg	ug/kg	ug/kg
p-Dichlorobenzene	330	ND	ND
m-Dichlorobenzene	330	ND	ND
1,2-Dichloroethane	330	ND	ND
Di-(2-chloroethyl)ether	330	ND	ND
1,2-Dichlorobenzene	330	ND	ND
Nitrosodimethylamine	330	ND	ND
Di-(2-chloroisopropyl)ether	330	ND	ND
Nitrosodi-n-propylamine	330	ND	ND
1,3-Dichlorobutadiene	330	ND	ND
1,4-Trichlorobenzene	330	ND	ND
Bromobenzene	330	ND	ND
Sophorone	330	ND	ND
n-Phthalene	330	ND	ND
Di-(2-chloroethoxy)methane	330	ND	ND
Chloronaphthalene	330	ND	ND
1,3-Dichlorocyclopentadiene	330	ND	ND
1-Naphthylene	330	ND	ND
1-Naphthene	330	ND	ND
Methyl phthalate	330	ND	ND
1,3-Dinitrotoluene	330	ND	ND
Toluene	330	ND	ND
1,4-Dinitrotoluene	330	ND	ND
Methyl phthalate	330	ND	ND
Nitrosodiphenylamine	330	ND	ND
1,3-Dichlorobenzene	330	ND	ND

* Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

page 2 of 5

Date Received: August 16, 1988
Date Reported: December 9, 1988

Work Order: 856
Job Number: OR001

FOR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Job Number:	88081889	88081890
Sample No.:	DANGB2-MW39- SS2	DANGB2-MW39- SS3
Date Sampled:	8-15-88	8-15-88
Time Sampled:	16:42	17:05
Date Extracted:	10-28-88	8-25-88
Date Analyzed:	11-02-88	10-03-88
Percent Moisture:	13	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Phenanthrene	330	ND	ND
Anthracene	330	ND	ND
Dibutyl phthalate	330	ND	ND
Fluoranthene	330	ND	ND
4-Chlorophenyl phenyl ether	330	ND	ND
Pyrene	330	ND	ND
Butyl Benzyl phthalate	330	ND	ND
Bis(2-ethylhexyl) phthalate	330	ND	ND
Dibenzofuran	330	ND	ND
4-Bromophenyl phenyl ether	330	ND	ND
Benzo(a)anthracene	330	ND	ND
1-methyl-2-naphthylphthalate	330	ND	ND
Benzo(b)fluoranthene	330	ND	ND
Benzo(k)fluoranthene	330	ND	ND
Benzenzidine	2000	ND	ND
3,3'-Dichlorobenzidine	660	ND	ND
Benzo(a)pyrene	330	ND	ND
Indeno(1,2,3-cd)pyrene	330	ND	ND
1-methylbenzo(a,h)anthracene	330	ND	ND
Benzo(ghi)perylene	330	ND	ND
Benzyl Alcohol	660	ND	ND

3 = Compound was detected in the blank.

Priority Pollutant Analysis
Base Neutrals - SW 8270
Matrix: Soil
(continued)

Page 3 of 5

Date Received: August 16, 1988
Date Reported: December 9, 1988

Work Order: 856
Job Number: OR001

Location: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Sample Number:	88081889	88081890
Sample No.:	DANGB2-MW39-SS2	DANGB2-MW39-SS3
Date Sampled:	8-15-88	8-15-88
Time Sampled:	16:42	17:05
Date Extracted:	10-28-88	8-25-88
Date Analyzed:	11-02-88	10-03-88
Percent Moisture:	13	8

Compound	Detection Limits ug/kg	Analytical Results (dry weight)	
		ug/kg	ug/kg
Acetophenone	---	ND	ND
Aniline	---	ND	ND
Aminobiphenyl	---	ND	ND
Chloroaniline	660	ND	ND
Chloronaphthalene	---	ND	ND
Benzofuran	330	ND	ND
Dimethylaminoazobenzene	---	ND	ND
1,2-Dimethylbenz(a)anthracene	---	ND	ND
1,4-Dimethylphenethylamine	---	ND	ND
Diphenylamine	---	ND	ND
1,2-Diphenylhydrazine	---	ND	ND
Methyl methanesulfonate	---	ND	ND
Methylcholanthrene	---	ND	ND
Methyl methanesulfonate	---	ND	ND
Methylnaphthalene	330	ND	ND
Naphthylamine	---	ND	ND
Naphthylamine	---	ND	ND
Nitroaniline	1600	ND	ND
Nitroaniline	1600	ND	ND
Nitroaniline	1600	ND	ND
Nitroso-di-n-butylamine	---	ND	ND
Nitrosopiperidine	---	ND	ND
Orthachlorobenzene	---	ND	ND
Orthachloronitrobenzene	---	ND	ND
Paracetamol	---	ND	ND
Picoline	---	ND	ND
Urethane	---	ND	ND
2,4,5-Tetrachlorobenzene	---	ND	ND

EPA has not yet determined detection limits for these compounds.

* Compound was detected in the blank.

Priority Pollutant Analysis
Pesticides and PCBs - SW 8270
Matrix: Soil

page 4 of 5

Date Received: August 16, 1988
Date Reported: December 9, 1988

Work Order: 856
Job Number: OR001

OR: ES:Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Lab Number:	88081889	88081890
Sample No.:	DANGB2-MW39- SS2	DANGB2-MW39- SS3
Date Sampled:	8-15-88	8-15-88
Time Sampled:	16:42	17:05
Date Extracted:	10-28-88	8-25-88
Date Analyzed:	11-02-88	10-03-88
Percent Moisture:	13	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Alpha-BHC	--*	ND	ND
Gamma-BHC	--*	ND	ND
Delta-BHC	660	ND	ND
Heptachlor	330	ND	ND
Delta-BHC	500	ND	ND
Dieldrin	330	ND	ND
Heptachlor epoxide	330	ND	ND
Endosulfan I	--*	ND	ND
Dieldrin	500	ND	ND
4'-DDE	1000	ND	ND
Dieldrin	--*	ND	ND
Endosulfan II	--*	ND	ND
4'-DDD	500	ND	ND
4'-DDT	830	ND	ND
Endosulfan Sulfate	1000	ND	ND
Dieldrin aldehyde	--*	ND	ND
Dieldrin Ketone	--*	ND	ND
Chlordane	2000	ND	ND
Heptachlor	--*	ND	ND
Xaphene	2000	ND	ND
roclor-1016	2000	ND	ND
roclor-1221	2000	ND	ND
roclor-1232	2000	ND	ND
roclor-1242	2000	ND	ND
roclor-1248	2000	ND	ND
roclor-1254	2000	ND	ND
roclor-1260	2000	ND	ND

EPA has not yet determined detection limits for these compounds.

= Compound was detected in the blank.

3163

Priority Pollutant Analysis
Acid Extractables -- SW 8270
Matrix: Soil

page 5 of 5

Date Received: August 16, 1988
Date Reported: December 9, 1988

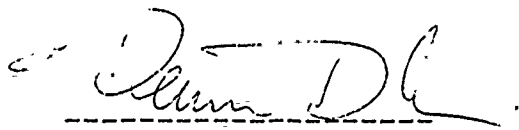
Work Order: 856
Job Number: OR001

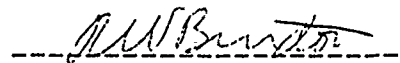
Location: ES: Oak Ridge/Duluth ANGB
Address: 710 S. Illinois Ave, Suite F-103
Oak Ridge, TN 37830

ATTN: Mr. Bill Hayden

Sample Number:	88081889	88081890
Sample No.:	DANGB2-MW39-SS2	DANGB2-MW39-SS3
Date Sampled:	8-15-88	8-15-88
Time Sampled:	16:42	17:05
Date Extracted:	10-28-88	8-25-88
Date Analyzed:	11-02-88	10-03-88
Percent Moisture:	13	8

Compound	Detection Limits ug/kg	ANALYTICAL RESULTS (dry weight)	
		ug/kg	ug/kg
Chlorophenol	330	ND	ND
Nitrophenol	330	ND	ND
enol	330	ND	ND
4-Dimethylphenol	330	ND	ND
4-Dichlorophenol	330	ND	ND
1,6-Trichlorophenol	330	ND	ND
Chloro-3-methylphenol	660	ND	ND
1-Dinitrophenol	1600	ND	ND
5-Dichlorophenol	--*	ND	ND
4ethyl-4,6-Dinitrophenol	1600	ND	ND
atachlorophenol	1600	ND	ND
Nitrophenol	1600	ND	ND
azoic Acid	1600	ND	ND
4ethylphenol	330	ND	ND
& 4-Methylphenol	330	ND	ND
1,4,6-Tetrachlorophenol	--*	ND	ND
4,5-Trichlorophenol	330	ND	ND


Analyst


Laboratory Supervisor

EPA has not yet determined detection limits for these compounds.

* Compound was detected in the blank.

NOTE: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

3164

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

TICs Found: //

Sample
Project No: ~~856~~ BLANK
Sample Matrix: soil
Conc. Unit: $\mu\text{g}/\text{kg}$
Work Order No: 856
Lab Sample ID: BLANK
Lab File ID: 8579Z
Date Received: —
Date Extracted: 3/25/88
Date Analyzed: 10/3/88
Date Reported:
Dilution Factor: 1
% Moisture: —

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
	Unknown	4.42	530	
	Unknown	4.55	1200	
	Unknown	4.89	200	
	Unknown	5.09	2300	
	Unknown	5.30	16000	
	Unknown	6.39	330	
	Unknown	6.93	430	
	Unknown	6.99	170	
	Unknown	21.73	470	
	Unknown	28.83	400	
	Unknown	39.04	400	

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Job No.:

Client:

Attn:

Address:

Project: DULUTH

TICs Found:

7

Sample
Project No: REX BLANK
Sample Matrix: SOIL
Conc. Unit: ug/kg
Work Order No: 856
Lab Sample ID: BLANK-REX
Lab File ID: 50333
Date Received: —
Date Extracted: 10/28/88
Date Analyzed: 11/2/88
Date Reported:
Dilution Factor: 1
% Moisture: —

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
	Unknown	4.98	330	
	Unknown	5.51	1700	
	Unknown	5.99	18,000	
	Unknown	7.29	170	
57-10-3	Hexadecanoic Acid	25.11	330	
	Unknown	29.89	1900	
	Unknown	34.85	170	

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

DANGB2-
mw37-551

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 856 SAS No.: _____ SDS No.: _____

Matrix: (soil/water) Soil

Lab Sample ID: 88081883

Sample wt/vol: 30 (g/mL) gm

Lab File ID: 50130

Level: (low/med) low

Date Received: 8/16/88

% Moisture: not dec. 14.0 dec. _____

Date Extracted: 8/25/88

Extraction: (SepF/Cont/Sonc) Sonc

Date Analyzed: 10/1/88

GPC Cleanup: (Y/N) N pH: _____

Dilution Factor: 1

Number TICs found: 13

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	<u>unknown</u>	<u>2.08</u>	<u>500</u>	
2.		<u>4.42</u>	<u>620</u>	
3.		<u>5.22</u>	<u>970</u>	
4.		<u>5.34</u>	<u>190</u>	
5.		<u>5.55</u>	<u>1000</u>	
6.		<u>6.07</u>	<u>15,000</u>	
7.		<u>7.33</u>	<u>460</u>	
8.		<u>25.08</u>	<u>230</u>	
9.	<u>57-10-3</u>	<u>25.29</u>	<u>2100</u>	
10.	<u>57-11-4</u>	<u>27.68</u>	<u>1500 310</u>	
11.	<u>unknown</u>	<u>30.03</u>	<u>7500 890</u>	
12.		<u>30.34</u>	<u>1200</u>	
13.		<u>37.36</u>	<u>700</u>	
14.				
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FORM I SV-TIC

1/87 Rev.

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

DAN6B2-
mw37-SS2

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 856 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil

Lab Sample ID: 88081884

Sample wt/vol: 30 (g/mL) gm

Lab File ID: 50131

Level: (low/med) low

Date Received: 8/16/88

% Moisture: not dec. 10.8 ¹¹ dec. _____
200 3/1/89

Date Extracted: 8/25/88

Extraction: (SepF/Cont/Sonc) Sonc

Date Analyzed: 10/1/88

GPC Cleanup: (Y/N) N pH: _____

Dilution Factor: 1

Number TICs found: 16

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	unknown	4.07	560	
2.		4.41	860	
3.		5.22	900	
4.		5.34	670	
5.		5.57	1000	
6.		6.05	15,000	
7.		7.33	410	
8.		19.68	190	
9.	57-10-3 hexadecanoic acid	25.28	2000	
10.	unknown	27.23	190	
11.	57-11-4 octadecanoic acid	27.68	200	
12.	unknown	30.82	820	
13.		30.40	1000	
14.		32.46	200	
15.		34.72	260	
16.		37.32	710	
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FORM I SV-TIC

1/87 Rev.

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

Lab Name: Engineering Science Contract: _____

DAN6B2 -
mw37-SS3

Lab Code: _____ Case No.: 856 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: 88081885

Sample wt/vol: 30 (g/mL) gm Lab File ID: S0132

Level: (low/med) low Date Received: 8/16/88

% Moisture: not dec. 14.8 ¹⁵ dec. _____ Date Extracted: 8/25/88

Extraction: (SepF/Cont/Sonc) Sonc Date Analyzed: 10/1/88

GPC Cleanup: (Y/N) N pH: _____ Dilution Factor: 1

Number TICs found: 20

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	unknown	4.42	700	
2.		5.22	470	
3.		5.60	1200	
4.		6.08	17000	
5.	57-10-3 hexadecanoic acid	25.28	1800	
6.	57-11-4 octadecanoic acid	27.68	310	
7.	unknown	29.23	310	
8.		30.02	1000	
9.		30.39	2900	
10.		30.68	430	
11.		32.40	860	
12.	unknown phthalate	32.90	310	
13.	unknown phthalate	33.09	450	
14.	unknown	33.55	780	
15.		34.73	230	
16.		34.87	620	
17.		36.58	590	
18.		37.30	550	
19.		38.27	470	
20.		40.36	310	
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FORM I SV-TIC

1/87 Rev.

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

DAN 62-
mw37-554

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 856 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil

Lab Sample ID: 88081886

Sample wt/vol: 30 (g/mL) gm

Lab File ID: E5790

Level: (low/med) low

Date Received: 8/16/88

% Moisture: not dec. 8.4 dec. _____
285 3/1/89

Date Extracted: 8/25/88

Extraction: (SepF/Cont/Sonc) Sonc

Date Analyzed: 10/3/88

GPC Cleanup: (Y/N) N pH: _____

Dilution Factor: 1

Number TICs found: 12

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	unknown alkene - C ₇ H ₁₄	4.35	290	
2.	unknown	4.45	870	
3.		4.57	730	
4.		4.81	620	
5.		5.26	16,000	
6.		6.43	360	
7.		24.03	250	
8. 57-10-3	hexadecanoic acid	24.15	1400	
9.	unknown	28.84	540	
10.		29.20	840	
11.		31.01	290	
12.		35.42	21,000	
13.				
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SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Job No.:

Client:

Attn:

Address:

Project: DULUTH

TICs Found: 10

Sample
Project No: DANGB2-MW37-555

Sample Matrix: 50% C

Conc. Unit: ug/L

Work Order No: 856

Lab Sample ID: E802/887 REX

Lab File ID: 50342

Date Received: 8/16/88

Date Extracted: 10/28/88

Date Analyzed: 11/2/88

Date Reported:

Dilution Factor: 1

% Moisture: 10

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
	Unknown	4.27	370	
	Unknown	4.57	180	
	Unknown	4.97	1400	
	Unknown	5.21	240	
	Unknown	5.47	1400	
	Unknown	5.97	20,000	
	1,1,2,2-tetrachloroethane			
	Unknown	7.42	180	
	Unknown	29.89	1700	
	Unknown hydrocarbon	30.15	220	
	Unknown	34.87	180	

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

DAN6B2-
mw39-551

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 856 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil

Lab Sample ID: 88081888

Sample wt/vol: 30 (g/mL) gm

Lab File ID: E5792

Level: (low/med) low 12

Date Received: 8/16/88

Moisture: not dec. 14.7 dec. _____
200 3/1/89

Date Extracted: 8/25/88

Extraction: (SepF/Cont/Sonc) Sonc

Date Analyzed: 10/3/88

GPC Cleanup: (Y/N) N pH: _____

Dilution Factor: 1

Number TICs found: 18

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	unknown	4.36	490	
2.		4.44	760	
3.		4.52	190	
4.		4.57	340	
5.		4.84	910	
6.		5.29	17000	
7.		6.45	1420	
8.		19.70	260	
9.	↓	23.98	530	
10.	57-10-3 hexadecanoic acid	24.18	2100	
11.	unknown	25.94	230	
12.		26.56	190	
13.		28.84	380	
14.	↓	29.16	920	
15.	117-81-7 bis(2-ethylhexyl) phthalate	30.77	110	
16.	unknown	30.87	230	
17.		35.14	1700	
18.	↓	35.44	18000	
19.				
20.				
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1/87 Rev.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Job No.:

Client:

Attn:

Address:

Project: *DULUTT*# TICs Found: *7*

Sample
~~Project~~ No: *DAN6B2-MW39-552*
 Sample Matrix: *501C*
 Conc. Unit: *mg/kg*
 Work Order No: *856*
 Lab Sample ID: *58081889 REX*
 Lab File ID: *50334*
 Date Received: *8/16/88*
 Date Extracted: *10/22/88*
 Date Analyzed: *11/5/88*
 Date Reported:
 Dilution Factor: *1*
 % Moisture: *13*

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
	<i>Unknown</i>	<i>5.50</i>	<i>2400</i>	
	<i>Unknown</i>	<i>5.98</i>	<i>29,000</i>	
	<i>Unknown</i>	<i>7.20</i>	<i>230</i>	
<i>57-10-3</i>	<i>Hexadecanoic Acid</i>	<i>25.14</i>	<i>1000</i>	
	<i>Unknown</i>	<i>29.89</i>	<i>1600</i>	
	<i>Unknown</i>	<i>30.15</i>	<i>190</i>	
	<i>Unknown</i>	<i>34.86</i>	<i>340</i>	

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

DAN682-
mw34-553

Lab Name: Engineering Science Contract: _____

Lab Code: _____ Case No.: 856 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil

Lab Sample ID: 88081890

Sample wt/vol: 30 (g/mL) gm

Lab File ID: E5794

Level: (low/med) low 202-7/1/89

Date Received: 8/16/88

Moisture: not dec. 8/1 dec. _____

Date Extracted: 8/25/88

Extraction: (SepF/Cont/Sonc) Sonc

Date Analyzed: 10/3/88

GPC Cleanup: (Y/N) N pH: _____

Dilution Factor: 1

Number TICs found: 16

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	<u>unknown</u>	<u>4.46</u>	<u>690</u>	
2.		<u>4.56</u>	<u>470</u>	
3.		<u>4.81</u>	<u>510</u>	
4.		<u>5.25</u>	<u>16,000</u>	
5.		<u>6.44</u>	<u>250</u>	
6.		<u>24.02</u>	<u>180</u>	
7.	<u>57-70 57-10-3</u>	<u>24.17</u>	<u>1500</u>	
8.	<u>hexadecanoic acid</u>	<u>26.57</u>	<u>180</u>	
9.	<u>unknown</u>	<u>28.84</u>	<u>910</u>	
10.		<u>29.17</u>	<u>990</u>	
11.		<u>29.32</u>	<u>620</u>	
12.		<u>32.87</u>	<u>290</u>	
13.		<u>33.16</u>	<u>340</u>	
14.		<u>35.31</u>	<u>20000</u>	
15.		<u>35.74</u>	<u>340</u>	
16.		<u>38.45</u>	<u>170</u>	
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FORM I SV-TIC

1/87 Rev.

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO.: 88081887, 88081889
WORK ORDER NO.: 856

Analysis of samples 88081887 and 88081889 resulted in low surrogate spike recoveries of two of the three base neutral surrogates. The samples were re-extracted out of holding time. Results of the second analysis showed good surrogate recoveries. No target compounds were found in either analysis of these samples.

QUALITY CONTROL RESULTS SUMMARY EPA METHOD 8270

Job No.: OR001
Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: BNA-S-0035-88
Sample Matrix: Soil
Conc. Unit: ug/KG
Date Received: 8-14-88
Date Prepared: 8-25-88
Date Analyzed: 9-30-88
Date Reported: 11-04-88
Dilution Factor: NA
%Moisture: 17

Project: Duluth ANGB
QC Report for Laboratory Sample No(s):
88081883-88081890
88081593, 88081591

Laboratory Supervisor Approval:

[Signature]

Fraction	Compound	SA	SR	MS	PR	MSD	PR	RPD	EPA QC Limit RPD %Recovery
B/N Laboratory Sample # 88081869*	1,2,4-Trichlorobenzene	4020	ND	2100	52	1990	50	4	23 38-107
	Acenaphthene	4020	ND	1910	48	1910	48	0	19 31-137
	2,4-Dinitrotoluene	4020	ND	2020	50	1980	49	2	47 28-89
	Pyrene	4020	ND	2220	55	2280	57	4	36 35-142
	N-Nitroso-di-n-Propylamine	4020	ND	3170	79	2910	72	9	38 41-126
	1,4-Dichlorobenzene	4020	ND	1590	40	1350	34	16	27 28-104
ACID Laboratory Sample # 88081869*	Pentachlorophenol	8030	ND	5540	69	5700	71	3	47 17-109
	Phenol	8030	ND	3480	43	3310	41	5	35 26-90
	2-Chlorophenol	8030	ND	3940	49	3600	44	8	50 25-102
	4-Chloro-3-Methylphenol	8030	ND	4100	51	3880	48	6	33 26-103
	4-Nitrophenol	8030	ND	8840	110	8920	111	1	50 11-114

NOTE: If % moisture is reported, results are presented on a dry-weight basis.
* The quality control sample is from a different project.

$$\text{Relative Percent Difference (RPD)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(\text{MS or MSD}) - \text{SR} \times 100}{\text{SA}}$$

NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No: ORG001

Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830

Sample Matrix: Soil
 Conc. Unit: ug/Kg
 Date Reported: 11-04-88

Laboratory Supervisor Approval:

Project: Duluth ANGB

[Signature]

File ID	Date Analyzed	Fraction	Instru- ment ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
E5500 3177	8-24-88	BNA	2	-	None Found	-	-	88081883-88081890, 88081593, 88081591

VOLATILE CONTINUING CALIBRATION CHECK

LabName: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____

Instrument IDVOCAL _____ Calibration Date(s): 10/1/88

LAB FILE ID: 45,46 _____ Init. Calib. Date(s): 9/22/88

COMPOUND	RRF	RRF50	%D
Benzyl chloride _____	4.43	7.60	-71.56
bis (2-chloroethoxy) methane _____	0.12		100.00
bis (2-chloroisopropyl ether) _____	0.12		100.00
Bromobenzene _____	3.08	4.20	-36.36
Bromodichloromethane _____	4.91	3.80	22.61
Bromoform _____	3.32	2.60	21.69
Bromomethane _____	0.43	0.00	100.00
Carbon tetrachloride _____	5.00	3.90	22.00
Chloroacetaldehyde _____	0.07		100.00
Chlorobenzene _____	1.38	1.10	20.29
Chloroethane _____	0.73	0.00	100.00
Chloroform _____	4.22	3.40	19.43
1-Chlorohexane _____	0.82	1.10	-34.15
2-Chloroethyl vinyl ether _____	0.12		100.00
Chloromethane _____	1.84	0.00	100.00
Chloromethyl methyl ether _____	0.02		100.00
o, m, & p-Chlorotoluenes _____	3.34	4.50	-34.73
Dibromochloromethane _____	4.68	3.60	23.08
Dibromomethane _____	3.06	4.30	-40.52
1,2-Dichlorobenzene _____	2.22	1.70	23.42
1,3-Dichlorobenzene _____	1.79	1.40	21.79
1,4-Dichlorobenzene _____	1.83	1.40	23.50
Dichlorodifluormethane _____	0.54		100.00
1,1-Dichloroethane _____	2.74	2.10	23.36
1,2-Dichloroethane _____	3.74	2.70	27.81
1,1-Dichloroethylene _____	1.32	1.20	9.09
trans-1,2-dichloroethylene _____	2.96	2.20	25.68
Dichloromethane _____	4.72	4.30	8.90
1,2-Dichloropropane _____	3.18	2.50	21.38
1,3-Dichloropropylene _____	0.47	0.68	-44.68
1,1,2,2-Tetrachloroethane _____	4.04	2.70	33.17
1,1,1,2-Tetrachloroethane _____	4.83	6.20	-28.36
Tetrachloroethylene _____	5.06	3.60	28.85
1,1,1-Trichloroethane _____	2.77	2.10	24.19
1,1,2-Trichloroethane _____	4.42	6.40	-44.80
Trichloroethylene _____	4.06	3.10	23.65
Trichlorofluormethane _____	0.78	0.56	28.21
Trichloropropane _____	3.08	4.20	-36.36
Vinyl chloride _____	1.84	0.00	100.00

3178

VOLATILE CONTINUING CALIBRATION CHECK

Instrument ID: 1001 Calibration Date(s): 10/1/88

LAB FILE ID: RRF 50 46

Initial cal = 9/22/88

COMPOUND	RRF	RRF50	%D
Benzene	4.45	3.30	-25.84
Chlorobenzene	4.74	3.80	-19.83
1,2_Dichlorobenzene	3.79	3.00	-20.84
1,3_Dichlorobenzene	4.18	3.30	-21.05
1,4_Dichlorobenzene	3.35	2.60	-22.39
Ethyl Benzene	3.10	2.50	-19.35
Toluene	3.55	3.00	-15.49
Xylenes	10.40	8.20	-21.15

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DATA PACKAGE #62

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ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Job No.: OR001

954

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the water sample received
by this laboratory on 9-08-88.

Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
88092294	DANGB-BG-MW50-GW-1	8010	9-07-88		9-14-88	9-16-88
88092294	DANGB-BG-MW50-GW-1	8020	9-07-88		9-14-88	9-16-88

* If applicable

88-A1-DULU0190 1

A SUBSIDIARY OF THE PARSONS CORPORATION

3183

CL-FRM01

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88092294
WORK ORDER NO.: 954

This water sample was received at the ES Berkeley Laboratory
on 9-08-88. It was received cold and intact.

ANALYSTS REPORT

WORK ORDER NUMBER: 954
JGB NUMBER : 280000000440
WORK ORDER DATE : 09/08/88

APPROVED BY

RWB
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE S103
OAK RIDGE, TN 37850
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (134)
710 S. ILLINOIS AVE. STE. S103
OAK RIDGE, TN 37850

OF REPORT COPIES: 1

CONTRACT / PO # : 08001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4. UNITS: ug/L. GROUP 8010

RANGE - R - MM50 -
AU-1
88091104

TEST COMPOUND

BENZYL CHLORIDE	ND
BIS (2-CHLOROETHOXY)METHANE	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND
BROMOBENZENE	ND
BROMODICHLOROMETHANE	ND
BROMOFORM	ND
BROMOETHANE	ND
CARBON TETRACHLORIDE	ND
CHLOROACETALDEHYDE	ND
CHLORAL	ND
CHLOROBENZENE	ND
CHLOROETHANE	ND
CHLOROFORM	14
1-CHLOROHEXANE	ND
2-CHLOROETHYL VINYL ETHER	ND
CHLOROMETHANE	ND
CHLOROMETHYL METHYL ETHER	ND
CHLOROTOLUENE	ND
DIBROMODICHLOROMETHANE	ND
DIBROMOMETHANE	ND
1,2-DICHLOROBENZENE	ND
1,3-DICHLOROBENZENE	ND
1,4-DICHLOROBENZENE	ND
DICHLORODIFLUOROMETHANE	ND
1,1-DICHLOROETHANE	ND
1,2-DICHLOROETHANE	ND
1,1-DICHLOROETHYLENE	ND
TRANS-1,2-DICHLOROETHYLENE	ND
DICHLOROMETHANE	1.78
1,2-DICHLOROPROPANE	ND

ND - Not Detected

ANALYSIS REPORT FOR WORK ORDER NUMBER 954

DANGB-RG-HW50-
GW-1
88092294

TEST COMPOUND

1,3-DICHLOROPROPYLENE	NO
1,1,2,2-TETRACHLOROETHANE	NO
1,1,1,2-TETRACHLOROETHANE	NO
TETRACHLOROETHYLENE	NO
1,1,1-TRICHLOROETHANE	NO
1,1,2-TRICHLOROETHANE	NO
TRICHLOROETHYLENE	NO
TRICHLOROFUOROMETHANE	NO
TRICHLOROPROPANE	NO
VINYL CHLORIDE	NO

NO - Not Detected

ANALYSIS REPORT

WORK ORDER NUMBER: 054
JOB NUMBER : 280000000440
WORK ORDER DATE : 09/05/88

APPROVED BY

AWB
Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE. STE. 5103
OAK RIDGE, TN 37830
BILL HAYDEN

CLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (: 341)
710 S. ILLINOIS AVE STE. 5103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT / PO # : 08001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4. UNITS: ug/L. GROUP 8030

DANGB-FB-1

TEST COMPOUND 88002294

-----	-----
BENZENE	ND
CHLOROBENZENE	ND
1,2-DICHLOROBENZENE	ND
1,3-DICHLOROBENZENE	ND
1,4-DICHLOROBENZENE	ND
ETHYL BENZENE	ND
TOLUENE	ND
XYLENES	ND

ND - Not Detected

3187

CHAIN OF CUSTODY RECORD

3188

QUALITY CONTROL RESULTS SUMMARY

VOLATILE ORGANICS
EPA 8010/8020

Job No.: OR001

Client: ES Oak Ridge
Attn: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

QC Report No: VGC-W-0047-88
Sample Matrix: Water
Conc. Unit: ug/L
Date Received: 9-12-88
Date Prepared: NA
Date Analyzed: 9-22-88
Date Reported: 10-25-88
Dilution Factor: NA

Project: Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):
88082256, 88092291-88092294
88092303-88092309, 88092312-88092317
88092321, 88082189

[Signature]

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
3189	Halocarbons: 8010									
	1,1-Dichloroethane	10	ND	9.59	96	9.28	93	3	26	70-130
	Trichloroethene	10	ND	10.2	102	10.3	103	1	19	65-131
	Chlorobenzene	10	ND	10.5	105	10.7	107	2	40	59-137
8897092321	Aromatics: 8020									
	Benzene	10	20	30.8	108	30.8	108	0	20	56-146
	Toluene	10	ND	10.7	107	9.72	97	10	41	42-150
	Chlorobenzene	10	ND	10.1	101	9.37	94	7	36	76-133

$$\text{Relative Percent Difference (PR)} = \frac{\text{MS} - \text{MSD}}{(\text{MS} + \text{MSD})/2} \times 100$$

$$\text{Percent Recovery (PR)} = \frac{(\text{MS or MSD}) - \text{S}^r \times 100}{\text{SA}}$$

MS = Spike Sample
MSD = Spike Sample Duplicate
SR = Sample Result
SA = Spike Added (Concentration)
NA = Not Applicable
NC = Not Calculated
ND = Not Detected

METHOD BLANK SUMMARY

Job No:

OR001

Client:

ES Oak Ridge

Attn:

Bill Hayden

Address:

710 S. Illinois Avenue

Suite F-103

Oak Ridge, Tn. 37830

Project:

Duluth ANGB

Sample Matrix:

Water

Conc. Unit:

ug/L

Date Reported:

10-25-88

Laboratory Supervisor Approval:

AWB

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
19	9-14-88	VGC	Carbopack	75-09-2	Dichloromethane	1.5	0.25	88092291-88092294
3190								

DATA PACKAGE #63

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ANALYSIS REPORT FOR WORK ORDER NUMBER 962

TASK: 4, UNITS: ug/L, GROUP 8020

	DANG8-FB6	DANG8-TB3
TEST COMPOUND	88092328	88092329
BENZENE	ND	ND
CHLOROBENZENE	ND	ND
1,2-DICHLOROBENZENE	ND	ND
1,3-DICHLOROBENZENE	ND	ND
1,4-DICHLOROBENZENE	ND	ND
ETHYL BENZENE	ND	ND
TOLUENE	ND	ND
XYLENES	ND	ND

ND - Not Detected

11/21/88

ANALYSIS REPORT FOR WORK ORDER NUMBER 962

TASK: 4, UNITS: ug/L, GROUP 8010

	DANGB-FB6	DANGB-TB3
TEST COMPOUND	88092328	88092329
BENZYL CHLORIDE	ND	ND
BIS (2-CHLOROETHOXY)METHANE	ND	ND
BIS (2-CHLOROISOPROPYL)ETHER	ND	ND
BROMOBENZENE	ND	ND
BROMODICHLOROMETHANE	ND	ND
BROMOFORM	ND	ND
BROMOETHANE	ND	ND
CARBON TETRACHLORIDE	ND	ND
CHLORACETALDEHYDE	ND	ND
CHLORAL	ND	ND
CHLOROBENZENE	ND	ND
CHLOROETHANE	ND	ND
CHLOROFORM	16	ND
1-CHLOROHEXANE	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND
CHLOROMETHANE	ND	ND
CHLOROMETHYL METHYL ETHER	ND	ND
CHLOROTOLUENE	ND	ND
DIBROMOCHLOROMETHANE	ND	ND
DIBROMOMETHANE	ND	ND
1,2-DICHLOROBENZENE	ND	ND
1,3-DICHLOROBENZENE	ND	ND
1,4-DICHLOROBENZENE	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND
1,1-DICHLOROETHANE	ND	ND
1,2-DICHLOROETHANE	ND	ND
1,1-DICHLOROETHYLENE	ND	ND
TRANS-1,2-DICHLOROETHYLENE	ND	ND
DICHLOROMETHANE	1.48	1.48
1,2-DICHLOROPROPANE	ND	ND
1,3-DICHLOROPROPYLENE	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND
1,1,1,2-TETRACHLOROETHANE	ND	ND
TETRACHLOROETHYLENE	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND
TRICHLOROETHYLENE	ND	ND
TRICHLOROFLUOROMETHANE	ND	ND
TRICHLOROPROPANE	ND	ND
VINYL CHLORIDE	ND	ND

ND - Not Detected

ES**ENGINEERING-SCIENCE, INC.**000 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7070

Job No.: OR001

954

Client: ES Oak Ridge
Attention: Bill Hayden
Address: 710 S. Illinois Avenue
Suite F-103
Oak Ridge, Tn. 37830

Project: Duluth ANGB

Attached are the analytical reports for the water sample received
by this laboratory on 9-08-88.Sample Preparation Data

Laboratory Sample No.	Client Sample ID	Test	Date collected	Date* extracted	Date analyzed	Date* 2nd col.
02294	DANGB-BG-MW50-GW-1	8010	9-07-88		9-14-88	9-16-88
02294	DANGB-BG-MW50-GW-1	8020	9-07-88		9-14-88	9-16-88

Applicable

88-A1-DULU0190 1

A SUBSIDIARY OF THE PARSONS CORPORATION

3194a

CL-FRM01

CASE NARRATIVE
QUALITY CONTROL RESULTS SUMMARY
SAMPLE NO(S).: 88092294
WORK ORDER NO.: 954

This water sample was received at the ES Berkeley Laboratory
on 9-08-88. It was received cold and intact.

3194b

DETECTION LIMITS
 HALOGENATED VOLATILE ORGANICS
 EPA METHOD 8010
 SAMPLE NO.: 88092294

Compound	Detection Limits
Benzyl chloride	0.50 ug/L
bis(2-chloroethoxy)methane	5.0 ug/L
bis(2-chloroisopropyl)ether	5.0 ug/L
Bromobenzene	0.50 ug/L
Bromodichloromethane	0.10 ug/L
Bromoform	0.20 ug/L
Bromomethane	1.2 ug/L
Carbon Tetrachloride	0.12 ug/L
Chloroacetaldehyde	50.0 ug/L
Chloral	50.0 ug/L
Chlorobenzene	0.25 ug/L
Chloroethane	0.52 ug/L
Chloroform	0.05 ug/L
1-Chlorohexane	0.50 ug/L
2-Chloroethyl vinyl ether	0.13 ug/L
Chloromethane	0.08 ug/L
Chloromethyl methyl ether	5.0 ug/L
O-, m-, & p-Chlorotoluenes	0.50 ug/L
Dibromochloromethane	0.09 ug/L
Dibromomethane	0.50 ug/L
1,2-Dichlorobenzene	0.15 ug/L
1,3-Dichlorobenzene	0.32 ug/L
1,4-Dichlorobenzene	0.24 ug/L
Dichlorodifluoromethane	1.8 ug/L
1,1-Dichloroethane	0.07 ug/L
1,2-Dichloroethane	0.03 ug/L
1,1-Dichloroethylene	0.13 ug/L
trans-1,2-Dichloroethylene	0.10 ug/L
Dichloromethane	0.25 ug/L
1,2-Dichloropropane	0.04 ug/L
trans-1,3-Dichloropropylene	0.34 ug/L
1,1,2,2-Tetrachloroethane	0.03 ug/L
1,1,1,2-Tetrachloroethane	0.50 ug/L
Tetrachloroethylene	0.03 ug/L
1,1,1-Trichloroethane	0.03 ug/L
1,1,2-Trichloroethane	0.02 ug/L
Trichloroethylene	0.12 ug/L
Trichlorofluoromethane	0.50 ug/L
Trichloropropane	0.50 ug/L
Vinyl chloride	0.18 ug/L

The method detection limits listed are based upon the EPA method listed. Dilution or other deviations from the normal procedures, required due to characteristics of a sample, will influence these values. These changes are described in the report narrative if applicable.

DETECTION LIMITS
AROMATIC VOLATILE ORGANICS
EPA METHOD 8020
SAMPLE NO.: 88092294

Compound	Detection Limits
Benzene	0.2 ug/L
Chlorobenzene	0.2 ug/L
1,2-Dichlorobenzene	0.4 ug/L
1,3-Dichlorobenzene	0.4 ug/L
1,4-Dichlorobenzene	0.3 ug/L
Ethylbenzene	0.2 ug/L
Toluene	0.2 ug/L
Xylenes (Dimethyl benzene)	0.4 ug/L

The method detection limits listed are based upon the EPA method listed. Dilution or other deviations from the normal procedures, required due to characteristics of a sample, will influence these values. These changes are described in the report narrative if applicable.

ENGINEERING-SCIENCE INC
10/28/88

PAGE 1

ANALYSIS REPORT

OFF ORDER NUMBER: 954
JOB NUMBER: 250000000440
WORK ORDER DATE: 09/08/88

APPROVED BY

Lab Supervisor

REPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE STE 5103
OAK RIDGE, TN 37850
BILL HAYDENCLIENT DATA:
ES OAK RIDGE/DULUTH ANGB (154)
710 S. ILLINOIS AVE. STE 5103
OAK RIDGE, TN 37850

OF REPORT COPIES: 1

CONTRACT / PO # : 00001
CONTACT : BILL HAYDEN
14151-481-3070

TASK: 4. UNITS: ug/L. GROUP 0010

1. GASE - PC - 10050 -

CU-1

0.000001

TEST COMPOUND

ETHYL CHLORIDE	ND
IS 12-CHLOROETHOXYMETHANE	ND
EIS 12-CHLOROISOPROPYLETHES	ND
BROMOBENZENE	ND
BROMODICHLOROMETHANE	ND
BROMOFORM	ND
BROMOETHANE	ND
PERBON TETRACHLORIDE	ND
CHLOROACETALDEHYDE	ND
CHLORAL	ND
CHLOROBENZENE	ND
CHLOROETHANE	ND
CHLOROFORM	14
-CHLOROHEXANE	ND
-CHLOROETHYL VINYL ETHER	ND
CHLOROMETHANE	ND
CHLOROMETHYL METHYL ETHER	ND
CHLOROTOLUENE	ND
TRIPOMCHLOROMETHANE	ND
TRIPOMOMETHANE	ND
1,2-DICHLOROBENZENE	ND
1,3-DICHLOROBENZENE	ND
1,4-DICHLOROBENZENE	ND
DICHLORODIFLUOROMETHANE	ND
1,1-DICHLOROETHANE	ND
1,2-DICHLOROETHANE	ND
1,1-DICHLOROETHYLENE	ND
TRANS-1,2-DICHLOROETHYLENE	ND
CHLOROMETHANE	1.73
1,2-DICHLOROPROPANE	ND

ND - Not Detected

31040

ENGINEERING-SCIENCE INC
10/26/88

PAGE 2

ANALYSIS REPORT FOR WORK ORDER NUMBER 954

DANGER-BE-TOXIC-

GW-1

EST COMPOUND

88092794

.3-DICHLOROPROPYLENE	NO
.1,2,2-TETRACHLOROETHANE	NO
.1,1,2-TRICHLOROETHANE	NO
ETRACHLOROETHYLENE	NO
.1,1-TRICHLOROETHANE	NO
.1,2-TRICHLOROETHANE	NO
RICHLOROETHYLENE	NO
RICHLOROFLUOROMETHANE	NO
RICHLOROPROPANE	NO
INYL CHLORIDE	NO


ENGINEERING-SCIENCE INC
10/26/88

PAGE 3

ANALYSTS REPORT

WORK ORDER NUMBER: 954
JOB NUMBER : 280000000440
WORK ORDER DATE : 09/08/88

APPROVED BY


Lab SupervisorREPORT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE STE. 5103
OAK RIDGE, TN 37830
BILL HAYDENCLIENT DATA:
ES OAK RIDGE/DULUTH ANGB
710 S. ILLINOIS AVE STE. 5103
OAK RIDGE, TN 37830

OF REPORT COPIES: 1

CONTRACT # PO # : 0R001
CONTACT : BILL HAYDEN
(615)-481-3920

TASK: 4. UNITS: ug/L. GROUP 8050

D0468-FB-1

TEST COMPOUND

68092794

BENZENE
CHLOROBENZENE
1,2-DICHLOROBENZENE
1,3-DICHLOROBENZENE
1,4-DICHLOROBENZENE
ETHYL BENZENE
TOLUENE
XYLENESND
ND
ND
ND
ND
ND
ND
ND

ND - Not Detected

3194n

QUALITY CONTROL RESULTS SUMMARY

VOLATILE ORGANICS

EPA 8010/8020

Job No.:

OR001

Client:

ES Oak Ridge

Attn:

Bill Hayden

Address:

710 S. Illinois Avenue

Suite F-103

Oak Ridge, Tn. 37830

QC Report No:

VGC-W-0047-88

Sample Matrix:

Water

Conc. Unit:

ug/L

Date Received:

9-12-88

Date Prepared:

NA

Date Analyzed:

9-22-88

Date Reported:

10-25-88

Dilution Factor:

NA

Project:

Duluth ANGB

Laboratory Supervisor Approval:

QC Report for Laboratory Sample No(s):

88082256, 88092291-88092294

88092303-88092309, 88092312-88092317

88092321, 88082189

Laboratory Sample No.	Compound	SA	SR	MS	PR	MSD	PR	RPD	ES RPD	QC Limits %Recovery
88092321	Halocarbons: 8010									
	1,1-Dichloroethane	10	ND	9.59	96	9.28	93	3	26	70-130
	Trichloroethene	10	ND	10.2	102	10.3	103	1	19	65-131
	Chlorobenzene	10	ND	10.5	105	10.7	107	2	40	59-137
8897092321	Aromatics: 8020									
	Benzene	10	20	30.8	108	30.8	108	0	20	56-146
	Toluene	10	ND	10.7	107	9.72	97	10	41	42-150
	Chlorobenzene	10	ND	10.1	101	9.37	94	7	36	75-133

Relative Percent Difference (PR) = $\frac{MS - MSD}{(MS + MSD)/2} \times 100$

Percent Recovery (PR) = $\frac{(MS \text{ or } MSD) - SR}{SA} \times 100$

MS = Spike Sample

MSD = Spike Sample Duplicate

SR = Sample Result

SA = Spike Added (Concentration)

NA = Not Applicable

NC = Not Calculated

ND = Not Detected

METHOD BLANK SUMMARY

Job No: OR001

Client: ES Oak Ridge
 Attn: Bill Hayden
 Address: 710 S. Illinois Avenue
 Suite F-103
 Oak Ridge, Tn. 37830

Project: Duluth ANGB

Sample Matrix: Water
 Conc. Unit: ug/L
 Date Reported: 10-25-88

Laboratory Supervisor Approval:

RWB

File ID	Date Analyzed	Fraction	Instrument ID	CAS Number	Compound (HSL, TIC or Unknown)	Conc	CRDL	Inclusive Sample Nos.
19	9-14-88	VGC	Carbopack	75-09-2	Dichloromethane	1.5	0.25	88092291-88092294

3194i

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

DATA PACKAGE #66

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Laboratory Services Group
5350 Campbells Run Road
Pittsburgh, PA 15205

REMIT TO:
Park West Two
Cliff Mine Road
Pittsburgh, PA 15275

412-788-1080

LAB ANALYSIS REPORT

CLIENT NAME: ENGINEERING-SCIENCE, INC.
ADDRESS: 710 S. ILLINOIS AVE., SUITE F103
OAK RIDGE, TN 37830

NUS CLIENT NO: 901206

VENDOR NO:
WORK ORDER NO: 5583
DATE RECEIVED: 09/08/88

REPORT DATE: 09/26/88

ATTENTION: MR. BILL HAYDEN

SAMPLE IDENTIFICATION		NUS SAMPLE NO	RESULTS	UNITS
DANGB-B1W1	08/31	18090381		
R800 Gross Alpha			< 3	pCi/l
R801 Gross Beta			< 6	pCi/l
R804 Radium-226			< 0.3	pCi/l
DANGB-B6-MW43-GW-1	09/07	18090382		
R800 Gross Alpha			4.6 +/- 2.7	pCi/l
R801 Gross Beta			11 +/- 4	pCi/l
R804 Radium-226			< 0.3	pCi/l
DANGB-B6-MW50-GW-1	09/07	18090383		
R800 Gross Alpha			4.2 +/- 2.6	pCi/l
R801 Gross Beta			8.5 +/- 3.7	pCi/l
R804 Radium-226			0.3 +/- 0.2	pCi/l
DANGB-BR1	09/07	18090384		
R800 Gross Alpha			< 3	pCi/l
R801 Gross Beta			< 6	pCi/l
R804 Radium-226			< 0.2	pCi/l

COMMENTS:

3197

Reviewed and Approved by: Joanne C. Simanic



Laboratory Services Group
5350 Campbells Run Road
Pittsburgh, PA 15205

REMIT TO:
Park West Two
Cliff Mine Road
Pittsburgh, PA 15275
412-788-1080

LAB ANALYSIS REPORT

CLIENT NAME: ENGINEERING SCIENCE, INC.
ADDRESS: 710 S. ILLINOIS AVE., SUITE F103
OAK RIDGE, TN 37830

REPORT DATE: 09/26/88

ATTENTION: MR. BILL HAYDEN

NUS CLIENT NO: 901206

VENDOR NO:

WORK ORDER NO: 5583

DATE RECEIVED: 09/09/88

SAMPLE IDENTIFICATION		NUS SAMPLE NO	RESULTS	UNITS
DANGB-BG-MW42-GW-1	09/08	18090490		
R800 Gross Alpha			< 3	pCi/l
R801 Gross Beta			< 6	pCi/l
R804 Radium-226			< 0.2	pCi/l
DANGB-BG-MW32-GW-1	09/08	18090491		
R800 Gross Alpha			5.5/-2.9	pCi/l
R801 Gross Beta			11/-4	pCi/l
R804 Radium-226			0.4/-0.2	pCi/l

COMMENTS:

3198

Reviewed and Approved by: Joanne C. Simanic



LABORATORY SERVICES GROUP

PARK WEST TWO
CLIFF MINE ROAD
PITTSBURGH, PA 15275-1071
(412) 788-1080

Lab Analysis Report

Client Name: Engineering-Science, Inc.
Address: 710 South Illinois Ave., Suite F-103
Oak Ridge, Tennessee 37830

Attention: Mr. William F. Hayden

Report Date: 11/17/88
Date of Receipt: 9/24/88
Sample ID No.: Dang B-BG-SL1-SW1
NUS Sample No.: P101521

<u>Determination</u>	<u>Result</u>	<u>Units</u>
Gross Alpha	<4	pCi/L
Gross Beta	<6	pCi/L
Radium -226	<0.3	pCi/L



LABORATORY SERVICES GROUP

PARK WEST TWO
CLIFF MINE ROAD
PITTSBURGH, PA 15275-1071
(412) 788-1080

Lab Analysis Report

Client Name: Engineering-Science, Inc.
Address: 710 South Illinois Ave., Suite F-103
Oak Ridge, Tennessee 37830

Attention: Mr. William F. Hayden

Report Date: 11/17/88
Date of Receipt: 9/24/88
Sample ID No.: Dang B-BG-SL2-SW1
NUS Sample No.: P101519

<u>Determination</u>	<u>Result</u>	<u>Units</u>
Gross Alpha	<4	pCi/L
Gross Beta	<6	pCi/L
Radium -226	<0.3	pCi/L



LABORATORY SERVICES GROUP

PARK WEST TWO
CLIFF MINE ROAD
PITTSBURGH, PA 15275-1071
(412) 788-1080

Lab Analysis Report

Client Name: Engineering-Science, Inc.
Address: 710 South Illinois Ave., Suite F-103
Oak Ridge, Tennessee 37830

Attention: Mr. William F. Hayden

Report Date: 11/17/88
Date of Receipt: 9/24/88
Sample ID No.: Dang B-BG-SL3-SW1
NUS Sample No.: P101520

<u>Determination</u>	<u>Result</u>	<u>Units</u>
Gross Alpha	<4	pCi/L
Gross Beta	<6	pCi/L
Radium -226	<0.3	pCi/L



LABORATORY SERVICES GROUP

PARK WEST TWO
CLIFF MINE ROAD
PITTSBURGH, PA 15275-1071
(412) 788-1080

Lab Analysis Report

Client Name: Engineering-Science, Inc.
Address: 710 South Illinois Ave., Suite F-103
Oak Ridge, Tennessee 37830

Attention: Mr. William F. Hayden

Report Date: 11/17/88
Date of Receipt: 9/23/88
Sample ID No.: Dang B-B6-SL4-SW1
NUS Sample No.: P101427

<u>Determination</u>	<u>Result</u>	<u>Units</u>
Gross Alpha	<4	pCi/L
Gross Beta	<6	pCi/L
Radium -226	<0.2	pCi/L



LABORATORY SERVICES GROUP

PARK WEST TWO
CLIFF MINE ROAD
PITTSBURGH, PA 15275-1071
(412) 788-1080

Lab Analysis Report

Client Name: Engineering-Science, Inc.
Address: 710 South Illinois Ave., Suite F-103
Oak Ridge, Tennessee 37830

Attention: Mr. William F. Hayden

Report Date: 11/17/88
Date of Receipt: 9/23/88
Sample ID No.: Dang B-B6-SL5-SW1
NUS Sample No.: P101433

<u>Determination</u>	<u>Result</u>	<u>Units</u>
Gross Alpha	<4	pCi/L
Gross Beta	<6	pCi/L
Radium -226	0.2 \pm 0.2	pCi/L



LABORATORY SERVICES GROUP

PARK WEST TWO
CLIFF MINE ROAD
PITTSBURGH, PA 15275-1071
(412) 788-1080

Lab Analysis Report

Client Name: Engineering-Science, Inc.
Address: 710 South Illinois Ave., Suite F-103
Oak Ridge, Tennessee 37830

Attention: Mr. William F. Hayden

Report Date: 11/17/88
Date of Receipt: 9/23/88
Sample ID No.: Dang B-10-GW10-D-GW1
NUS Sample No.: P101432

<u>Determination</u>	<u>Result</u>	<u>Units</u>
Gross Alpha	<20	pCi/L
Gross Beta	34 \pm 14	pCi/L
Radium -226	2.4 \pm 0.4	pCi/L



LABORATORY SERVICES GROUP

PARK WEST TWO
CLIFF MINE ROAD
PITTSBURGH, PA 15275-1071
(412) 788-1080

Lab Analysis Report

Client Name: Engineering-Science, Inc.
Address: 710 South Illinois Ave., Suite F-103
Oak Ridge, Tennessee 37830

Attention: Mr. William F. Hayden

Report Date: 11/17/88
Date of Receipt: 9/23/88
Sample ID No.: Dang B-B6-SL25-SW1
NUS Sample No.: P101429

<u>Determination</u>	<u>Result</u>	<u>Units</u>
Gross Alpha	<4	pCi/L
Gross Beta	<6	pCi/L
Radium -226	0.4 ± 0.2	pCi/L



LABORATORY SERVICES GROUP

PARK WEST TWO
CLIFF MINE ROAD
PITTSBURGH, PA 15275-1071
(412) 788-1080

Lab Analysis Report

Client Name: Engineering-Science, Inc.
Address: 710 South Illinois Ave., Suite F-103
Oak Ridge, Tennessee 37830

Attention: Mr. William F. Hayden

Report Date: 11/17/88
Date of Receipt: 9/23/88
Sample ID No.: Dang B-B6-GW10-A-GW1
NUS Sample No.: P101428

<u>Determination</u>	<u>Result</u>	<u>Units</u>
Gross Alpha	33 \pm 10	pCi/L
Gross Beta	150 \pm 30	pCi/L
Radium -226	4.4 \pm 0.6	pCi/L



LABORATORY SERVICES GROUP

PARK WEST TWO
CLIFF MINE ROAD
PITTSBURGH, PA 15275-1071
(412) 788-1080

Lab Analysis Report

Client Name: Engineering-Science, Inc.
Address: 710 South Illinois Ave., Suite F-103
Oak Ridge, Tennessee 37830

Attention: Mr. William F. Hayden

Report Date: 11/17/88
Date of Receipt: 9/23/88
Sample ID No.: Dang B-10-GW10-B-GW1
NUS Sample No.: P101431

<u>Determination</u>	<u>Result</u>	<u>Units</u>
Gross Alpha	10 \pm 5	pCi/L
Gross Beta	78 \pm 9	pCi/L
Radium -226	1.4 \pm 0.3	pCi/L



LABORATORY SERVICES GROUP

PARK WEST TWO
CLIFF MINE ROAD
PITTSBURGH, PA 15275-1071
(412) 788-1080

Lab Analysis Report

Client Name: Engineering-Science, Inc.
Address: 710 South Illinois Ave., Suite F-103
Oak Ridge, Tennessee 37830

Attention: Mr. William F. Hayden

Report Date: 11/17/88
Date of Receipt: 9/23/88
Sample ID No.: Dang B-10-GW10-C-GW1
NUS Sample No.: P101430

<u>Determination</u>	<u>Result</u>	<u>Units</u>
Gross Alpha	7.0 \pm 3	pCi/L
Gross Beta	11 \pm 4	pCi/L
Radium -226	0.3 \pm 0.2	pCi/L

ENGINEERING-SCIENCE

CHAIN OF CUSTODY RECORD

ES JOB NO. OR001	PROJECT NAME/LOCATION Duluth ANGB/Duluth, Mn.		NO. OF CON- TAINERS	WATER ANALYSES REQUIRED										SHIP TO: ENGINEERING-SCIENCE LABORATORY, INC. 600 Bancroft Way Berkeley, CA 94710			
	DATE	TIME		SAMPLE DESCRIPTION	SW 6070, 6020	EPA 608	EPA 625	EPA 410.1	SW 6070, 7000, 7131	SW 7421, 7470	SW 9370, 9375	CM 420	REMARKS				
	8-31-88	1500	DANGB-DIWI	1													
	9-7-88	1435	DANGB-BG-MW43-GW-1	1													
	9-7-88	1505	DANGB-BG-MW50-GW-1	1													
	9-7-88	10900	DANGB-BR1	1													
<div style="font-size: 2em; transform: rotate(-15deg); opacity: 0.5;"> <i>Handwritten signature and date: 9/7/88</i> </div>																	
Relinquished by: (Signature)				Received by: (Signature)				Relinquished by: (Signature)				Received by: (Signature)					
Date/Time				Date/Time				Date/Time				Date/Time					
9-7-88 1800																	
Relinquished by: (Signature)				Received for Laboratory by: (Signature)				Relinquished by: (Signature)				Received by: (Signature)					
Date/Time				Date/Time				Date/Time				Date/Time					
				9/8/88													

3209

CHAIN OF CUSTODY RECORD

Distribution: Original Accomplies Shipment, Copy to Coordinator Field Files

[illegible]

CHAIN OF CUSTODY RECORD

ES JOB NO.	PROJECT NAME/LOCATION	NO. OF CONTAINERS	WATER ANALYSES REQUIRED	SHIP TO:
OR001	Duluth ANGB/Duluth, Mn.		SW 608, 609 EPA 608 EPA 625 EPA 470.1 SW 607, 700, 710 SW 742, 747 SW 930, 931 SW 423	NUS Corporation 5350 Campbells Run Rd P.ittsburg, PA 15205 Attn: Anna De Prek
DATE	TIME	SAMPLE DESCRIPTION	REMARKS	
9/24	10:45	DANAB - BG - SL2 - SW1	X	
9/24	14:05	DANAB - BG - SL3 - SW1	X	
9/24	9:15	DANAB - BG - SL1 - SW1	X	
<div style="border: 1px solid black; width: 100%; height: 100%; transform: rotate(45deg);"></div>				

Relinquished by: (Signature) *[Signature]*

Relinquished by: (Signature) *[Signature]*

Date/Time 9/24/16-30

Date/Time

Received by: (Signature)

Received for Laboratory by: (Signature) *[Signature]*

Date/Time

Date/Time 9/27/0930

Relinquished by: (Signature)

Relinquished by: (Signature)

Date/Time

Date/Time

Received by: (Signature)

Received by: (Signature)

Date/Time

Date/Time

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Company

Lawrence Davis Inc.

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City

Oak Ridge, TN

State

TN

ZIP Required

37830

Your Phone Number (Very Important)

(615) 821-2422

Department/Floor No.

3rd

To (Recipient's Name) Please Print

David D. Hoke

Company

Yates Corporation

Exact Street Address (We Cannot Deliver to P.O. Boxes or R.F.D. Zip Codes)

15350 Cambridge Rd.

City

Pittsburgh, PA

State

PA

ZIP Required

15265

Recipient's Phone Number (Very Important)

Department/Floor No.

Exact Street Address (We Cannot Deliver to P.O. Boxes or R.F.D. Zip Codes)

City

State

ZIP Required

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DR - 11016 - 4207 - 8

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- 3 ☐ OVERNIGHT ☐ DELT
- 4 ☐ OVERNIGHT ☐ TUBE
- 5 ☐ STANDARD AIR (Delivery not later than second business day)

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- 1 ☐ HOLD FOR PICK-UP ☐ DELIVER WEEKDAY
- 2 ☐ DELIVER SATURDAY ☐ DELIVER SUNDAY
- 3 ☐ DELIVER SUNDAY ☐ DELIVER MONDAY
- 4 ☐ DELIVER MONDAY ☐ DELIVER TUESDAY
- 5 ☐ DELIVER TUESDAY ☐ DELIVER WEDNESDAY
- 6 ☐ DELIVER WEDNESDAY ☐ DELIVER THURSDAY
- 7 ☐ DELIVER THURSDAY ☐ DELIVER FRIDAY
- 8 ☐ DELIVER FRIDAY ☐ DELIVER SATURDAY
- 9 ☐ DELIVER SATURDAY ☐ DELIVER SUNDAY
- 10 ☐ DELIVER SUNDAY ☐ DELIVER MONDAY
- 11 ☐ DELIVER MONDAY ☐ DELIVER TUESDAY
- 12 ☐ DELIVER TUESDAY ☐ DELIVER WEDNESDAY

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PACKAGES	WEIGHT	THAT INCLUDES	UNIT
1	2.7	1	2.7
Total	2.7	1	2.7

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Signature

Date/Time for FEDEX Use

9/23/88 4/1

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3213



LABORATORY SERVICES GROUP
5350 CAMPBELLS RUN ROAD
PITTSBURGH, PA 15205
(412) 747-2500
FAX (412) 747-2559

November 29, 1988

Mr. William Hayden
Engineering-Science, Inc.
710 South Illinois Avenue
Suite F-103
Oak Ridge, Tennessee 37830

SUBJECT: Quality control data and chain-of-custody forms for sample numbers;
18090381-384, 18090490-491, P101427-433 and P101519-521.

Dear Mr. Hayden:

The quality control data summaries for samples; 18090381-384, 18090490-491, P101427-433 and P101519-521 are enclosed. The original chain-of-custody forms for samples P101427-433 and P101519-521 are included, and copies for samples 18090381-384 and 18090490-491 are enclosed since the originals were sent to Engineering-Science, Inc. at an earlier date.

The quality control data summaries include duplicate, spike and blank data for the gross alpha, gross beta and Radium-226 analyses.

Please contact me if you have any questions or comments concerning this information.

Yours very truly,

A handwritten signature in dark ink, appearing to read "Greg Malzone", with a horizontal line extending to the right.

Greg Malzone
Quality Assurance Representative
Laboratory Services Group

GAM/ckh

Enclosures

QUALITY CONTROL DATA FOR RADIOCHEMICAL ANALYSES

As part of the Laboratory Services Group's quality assurance program for radiochemical analyses, duplicate and method spike analyses and background and performance checks are performed. For every ten samples analyzed, one sample is analyzed in duplicate and a method spike is analyzed. A minimum of one background check and one performance check standard are run during each 24-hour period that the instrument is in use.

The precision of each duplicate analysis is calculated as the range (R) of the two results or the relative percent difference (RPD), depending on the method performed and the level of activity in the sample analyzed in duplicate.

$$\text{Range} = R = |R1 - R2|$$

$$\text{Precision} = \text{RPD} = \left| \frac{R1 - R2}{(R1 + R2)/2} \right| \times 100$$

R1 = First Result
R2 = Second Result

The accuracy of each method spike analysis is calculated as the percent recovery.

$$\text{Accuracy} = \text{Percent Recovery} = \frac{AR}{TR} \times 100$$

AR = Actual Result
TR = Theoretical Result

Control limits and advisory control limits are established by initially calculating the average (\bar{X}) and the standard deviation (θ) of the most recent range, RPD, percent recovery, background check, and performance check values:

$$\bar{X} = \frac{1}{n} \sum_{i=1}^n X_i$$

$$\theta = \sqrt{\frac{1}{n-1} \sum_{i=1}^n (\bar{X} - X_i)^2}$$

X = Range, RPD, percent recovery, background check, or performance check value.

Control limits are established for $n = 26$ to 51 values; advisory control limits are established for $n = 10$ to 25 values.

The limits for precision are the range from zero to three times the standard deviation. The limits for accuracy are the range of the average percent recovery plus and minus two times the standard deviation. The limits for the background and performance checks are the average background/performance check value plus and minus three times the standard deviation.

When precision or accuracy exceeds the control limits, corrective action must be taken prior to release of the data. (This may consist of reanalysis of the sample in question, or of all the samples in the set, if there is no evidence that the cause of the poor precision or accuracy was limited to the QC sample.)

When a background or performance check exceeds the limits, sample analysis is suspended until a conforming check is run and all samples counted after the last acceptable check are rerun.

GROSS ALPHA/BETA
QUALITY CONTROL DATA SHEET

Sample Number(s): 18090490 - 0491

Book and Page Number(s): GAB-04-104

Date(s) of Analysis: 9/16-17/88

Instrument
Identification: Tennelec LB5100

	<u>ALPHA</u>			<u>BETA</u>		
Blank Planchet (CPM):	<u>0.03</u>	<u>0.14</u>	<u>0.11</u>	<u>0.97</u>	<u>0.96</u>	<u>0.94</u>
Performance Check:	<u>0.282</u>	<u>0.280</u>		<u>0.475</u>	<u>0.477</u>	

Matrix Duplicates:						
Sample Number	<u>18090490</u>			<u>18090490</u>		
Original Result*	<u><3 pCi/L</u>			<u><6 pCi/L</u>		
Duplicate Result*	<u><3 pCi/L</u>			<u>5.41 pCi/L</u>		
RPD/Range	<u>-</u>			<u>-</u>		

Standard (Spike):						
Solution Number/ Volume	<u>#2AB/4mL</u>			<u>#2AB/4mL</u>		
Actual Result*	<u>0.83 pCi/mL</u>			<u>4.62 pCi/mL</u>		
Theoretical Result*	<u>0.69 pCi/mL</u>			<u>4.48 pCi/mL</u>		
% Recovery	<u>120.3</u>			<u>103.1</u>		

Method Blank:						
Volume (mL)	<u>0.5 L</u>			<u>0.5 L</u>		
Result*	<u><0.5 pCi/L</u>			<u><1 pCi/L</u>		

**GROSS ALPHA/BETA
QUALITY CONTROL DATA SHEET**

Sample Number(s): 18090289-0291; 18090381-0384
18090421-0422; 18090394
 Book and Page Number(s): GAB-04; 98-103
 Date(s) of Analysis: 9/12/, 14-15/88

Instrument
 Identification: Tennelec LB5100

	<u>ALPHA</u>			<u>BETA</u>		
Blank Planchet (CPM):	<u>0.11</u>	<u>0.10</u>	<u>0.04</u>	<u>1.02</u>	<u>1.19</u>	<u>0.91</u>
Performance Check:	<u>0.273</u>	<u>0.285</u>	<u>0.283</u>	<u>0.473</u>	<u>0.480</u>	<u>0.483</u>

Matrix Duplicates:

	<u>18090290</u>	<u>18090422</u>	<u>18090290</u>	<u>18090422</u>
Sample Number				
Original Result*	<u>5.11 pCi/L</u>	<u><6 pCi/L</u>	<u>ALPHA</u>	<u>179 pCi/L</u>
Duplicate Result*	<u>5.87 pCi/L</u>	<u>5.7 pCi/L</u>	<u>Analysis</u>	<u>166 pCi/L</u>
RPD/Range	<u>0.76 pCi/L</u>	<u>-</u>	<u>Only</u>	<u>7.54%</u>
	<u>(Range)</u>			<u>(RPD)</u>

Standard (Spike):

	(Matrix Spike)		(Matrix Spike)	
	<u>18090291+</u>	<u>18090291+</u>	<u>18090291+</u>	<u>18090291+</u>
Solution Number/ Volume	<u>#2AB/3mL</u>	<u>#2AB/1mL</u>	<u>#2AB/3mL</u>	<u>#2AB/1mL</u>
Actual Result*	<u>0.72 pCi/mL</u>	<u>0.48 pCi/mL</u>	<u>4.66 pCi/mL</u>	<u>4.46 pCi/mL</u>
Theoretical Result*	<u>0.69 pCi/mL</u>	<u>0.69 pCi/mL</u>	<u>4.48 pCi/mL</u>	<u>4.48 pCi/mL</u>
% Recovery	<u>104.3</u>	<u>104.0</u>	<u>104.0</u>	<u>99.5</u>

Method Blank:

Volume (mL)	<u>0.5L</u>	<u>0.5L</u>
Result*	<u><0.5 pCi/L</u>	<u><1 pCi/L</u>

**GROSS ALPHA/BETA
QUALITY CONTROL DATA SHEET**

Sample Number(s): P101427-1433, P101519-1521

Book and Page Number(s): 60-86, p. 26

Date(s) of Analysis: 10/3-4/88

Instrument

Identification: Tennelec LB5100

ALPHA

BETA

Blank Planchet (CPM): 0.15 0.13 0.13 _____

Performance Check: 0.282 0.287 0.279 _____

0.96 1.21 1.07 _____

0.479 0.473 0.476 _____

Matrix Duplicates:

Sample Number P101427 _____

Original Result* <4 pCi/L _____

Duplicate Result* <4 pCi/L _____

RPD/Range - _____

P101427 _____

<6 pCi/L _____

<6 pCi/L _____

- _____

Standard (Spike):

Solution Number/
Volume #2AB/5mL _____

Actual Result* 0.70 pCi/mL _____

Theoretical Result* 0.69 pCi/mL _____

% Recovery 101.4 _____

#2AB/5mL _____

4.55 pCi/mL _____

4.48 pCi/mL _____

101.6 _____

Method Blank:

Volume (mL) 0.5 L _____

Result* <0.6 pCi/L _____

0.5 L _____

<1 pCi/L _____

RADIUM-226 (PLANCHET METHOD)

QUALITY CONTROL DATA SHEET

Sample Number(s): P101519-1521, P101849-1850

Instrument

Book and Page Number(s): 60-86, p. 29Identification: Tennelec LB5100Date(s) of Analysis: 10/11-12/88Background (CPM): 0.04 0.04 0.02 0.03Performance Check: 0.282 0.284 0.280

Matrix Duplicates:

Sample Number P101849Original Result* 0.21 pCi/LDuplicate Result* <0.3 pCi/LRPD/Range --

Standard (Spike):

Solution Number/
Volume#1A1B/5 mLActual Result* 7.27 pCi/mLTheoretical Result* 6.81 pCi/mL% Recovery 106.7

Method Blank:

Volume (mL)

1 L

Result*

<0.2 pCi/L

Specify Units

RADIUM-226 (PLANCHET METHOD)

QUALITY CONTROL DATA SHEET

Sample Number(s): P101427 - 1433

Instrument

Book and Page Number(s): 60-86; p. 27Identification: Tennelec LB 5100Date(s) of Analysis: 10/5/88Background (CPM): 0.04 0.02 _____Performance Check: 0.279 0.279 _____

Matrix Duplicates:

Sample Number P101427 _____Original Result* <0.2 pCi/L _____Duplicate Result* <0.2 pCi/L _____RPD/Range - _____

Standard (Spike):

Solution Number/
Volume #1A1B/3mL _____Actual Result* 5.87 pCi/mL _____Theoretical Result* 6.81 pCi/mL _____% Recovery 86.2 _____

Method Blank:

Volume (mL) 1 L _____Result* <0.1 pCi/L _____

* Specify Units

RADIUM-226 (PLANCHET METHOD)

QUALITY CONTROL DATA SHEET

Sample Number(s): 18090490-0491, 18090421-0422, 18090381-0384, 18090394

Book and Page Number(s): RAD - 08; 140-143, 146

Date(s) of Analysis: 9/20-21/88

Instrument

Identification: Tennelec LB5100Background (CPM): 0.03 0.05 0.10 0.03Performance Check: 0.286 0.289 0.284

Matrix Duplicates:

Sample Number 18090394Original Result* <0.1 pCi/LDuplicate Result* <0.1 pCi/LRPD/Range -

Standard (Spike):

Solution Number/
Volume#1A1B/2mLActual Result* 4.75 pCi/mLTheoretical Result* 6.81 pCi/mL% Recovery 69.7

Method Blank:

Volume (mL)

1 L

Result*

<0.2 pCi/L

Specify Units



Laboratory Services Group
5350 Campbells Run Road
Pittsburgh, PA 15205

REMIT TO:
Park West Two
Cliff Mine Road
Pittsburgh, PA 15275

412-788-1080

1.

LABORATORY ANALYSIS REPORT

CLIENT NAME: ENGINEERING-SCIENCE, INC.
ADDRESS: 710 S. ILLINOIS AVE., SUITE F103
OAK RIDGE, TN 37830-0000

NUS CLIENT NO: 0734 0001

VENDOR NO: 00795506

WORK ORDER NO: 55830

REPORT DATE: 01/25/89

ATTENTION: MR. BILL HAYDEN

SAMPLE IDENTIFICATION: DANGB-BG-SL2-SW1 (P101519)
NUS SAMPLE NO: P0108289
DATE SAMPLED : 9/23/88
DATE RECEIVED: 19-JAN-89 Relog date/24-SEP-88 Received date
APPROVED BY: Joanne C. Simanic

<u>TEST</u>	<u>DETERMINATION</u>	<u>RESULT</u>	<u>UNIT</u>
R50	Tritium	< 2000	pCi/L

COMMENTS:



Laboratory Services Group
5350 Campbells Run Road
Pittsburgh, PA 15205

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Cliff Mine Road
Pittsburgh, PA 15275

412-788-1080

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LABORATORY ANALYSIS REPORT

CLIENT NAME: ENGINEERING-SCIENCE, INC.
ADDRESS: 710 S. ILLINOIS AVE., SUITE F103
OAK RIDGE, TN 37830-0000

NUS CLIENT NO: 0734 0001

VENDOR NO: 00795506
WORK ORDER NO: 55830

ATTENTION: MR. BILL HAYDEN

REPORT DATE: 01/25/89

SAMPLE IDENTIFICATION: DANGB-BG-SL3-SW1 (P101520)
NUS SAMPLE NO: P0108290
DATE SAMPLED : 9/23/88
DATE RECEIVED: 19-JAN-89 Re-log date/24-SEP-88 Received date
APPROVED BY: Joanne C. Simanic

<u>TEST</u>	<u>DETERMINATION</u>	<u>RESULT</u>	<u>UNIT</u>
R50	Tritium	< 2000	pCi/L

COMMENTS:



Laboratory Services Group
5350 Campbells Run Road
Pittsburgh, PA 15205

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Pittsburgh, PA 15275

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LABORATORY ANALYSIS REPORT

CLIENT NAME: ENGINEERING-SCIENCE, INC.
ADDRESS: 710 S. ILLINOIS AVE., SUITE F103
OAK RIDGE, TN 37830-0000

NUS CLIENT NO: 0734 0001

VENDOR NO: 00795506
WORK ORDER NO: 55830

ATTENTION: MR. BILL HAYDEN

REPORT DATE: 01/25/89

SAMPLE IDENTIFICATION: DANGB-BG-SL1-SW1 (P101521)
NUS SAMPLE NO: P0108291
DATE SAMPLED : 9/23/88
DATE RECEIVED: 19-JAN-89 Relog date/24-SEP-88 Received date
APPROVED BY: Joanne C. Simanic

<u>TEST</u>	<u>DETERMINATION</u>	<u>RESULT</u>	<u>UNIT</u>
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R50	Tritium		
-----	---------	--	--

< 2000 pCi/L

COMMENTS:

3225



Laboratory Services Group
5350 Campbells Run Road
Pittsburgh, PA 15205

REMIT TO:
Park West Two
Cliff Mine Road
Pittsburgh, PA 15275

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1.

LABORATORY ANALYSIS REPORT

CLIENT NAME: ENGINEERING-SCIENCE, INC.

NUS CLIENT NO: 0734 0001

ADDRESS: 710 S. ILLINOIS AVE., SUITE F103
OAK RIDGE, TN 37830-0000

VENDOR NO: 00795506

REPORT DATE: 01/25/89

WORK ORDER NO: 55830

ATTENTION: MR. BILL HAYDEN

SAMPLE IDENTIFICATION: DANGB-BG-SLA-SW1. (P101427)

NUS SAMPLE NO: P0108292

DATE SAMPLED : 9/23/88

DATE RECEIVED: 19-JAN-89 Re-log date/24-SEP-88 Received date

APPROVED BY: Joanne C. Simanic

<u>TEST</u>	<u>DETERMINATION</u>	<u>RESULT</u>	<u>UNIT</u>
R50	Tritium	< 2000	pCi/L

COMMENTS:



Laboratory Services Group
5350 Campbells Run Road
Pittsburgh, PA 15205

REMIT TO:
Park West Two
Cliff Mine Road
Pittsburgh, PA 15275
412-788-1080

1.

LABORATORY ANALYSIS REPORT

CLIENT NAME: ENGINEERING-SCIENCE, INC.
ADDRESS: 710 S. ILLINOIS AVE., SUITE F103
OAK RIDGE, TN 37830-0000

NUS CLIENT NO: 0734 0001

REPORT DATE: 01/25/89

VENDOR NO: 00795506
WORK ORDER NO: 55830

ATTENTION: MR. BILL HAYDEN

SAMPLE IDENTIFICATION: DANGB-10GW10-A-GW1 (P101428)
NUS SAMPLE NO: P0108293
DATE SAMPLED : 9/23/88
DATE RECEIVED: 19-JAN-89 Relog date/24-SEP-88 Received date
APPROVED BY: Joanne C. Simanic

<u>TEST</u>	<u>DETERMINATION</u>	<u>RESULT</u>	<u>UNIT</u>
R50	Tritium	< 2000	pCi/L

COMMENTS:



Laboratory Services Group
5350 Campbells Run Road
Pittsburgh, PA 15205

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Pittsburgh, PA 15275

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LABORATORY ANALYSIS REPORT

CLIENT NAME: ENGINEERING-SCIENCE, INC.

NUS CLIENT NO: 0734 0001

ADDRESS: 710 S. ILLINOIS AVE., SUITE F103
OAK RIDGE, TN 37830-0000

VENDOR NO: 00795506

REPORT DATE: 01/25/89

WORK ORDER NO: 55830

ATTENTION: MR. BILL HAYDEN

SAMPLE IDENTIFICATION: DANGB-BG-SL25-SW-1 (P101429)

NUS SAMPLE NO: P0108294

DATE SAMPLED : 9/23/88

DATE RECEIVED: 19-JAN-89 Relog date/24-SEP-88 Received date

APPROVED BY: Joanne C. Simanic

TEST DETERMINATION

RESULT UNIT

R50 Tritium

< 2000 pCi/L

COMMENTS:



Laboratory Services Group
5350 Campbells Run Road
Pittsburgh, PA 15205

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Cliff Mine Road
Pittsburgh, PA 15275

412-788-1080

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LABORATORY ANALYSIS REPORT

CLIENT NAME: ENGINEERING-SCIENCE, INC.
ADDRESS: 710 S. ILLINOIS AVE., SUITE F103
OAK RIDGE, TN 37830-0000

NUS CLIENT NO: 0734 0001

VENDOR NO: 00795506
WORK ORDER NO: 55830

REPORT DATE: 01/25/89

ATTENTION: MR. BILL HAYDEN

SAMPLE IDENTIFICATION: DANGB-10GW10-GW1 (P101430)
NUS SAMPLE NO: P0108295
DATE SAMPLED : 9/23/88
DATE RECEIVED: 19-JAN-89 Relog date/24-SEP-88 Received date
APPROVED BY: Joanne C. Simanic

<u>TEST</u>	<u>DETERMINATION</u>	<u>RESULT</u>	<u>UNIT</u>
R50	Tritium	< 2000	pCi/L

COMMENTS:



Laboratory Services Group
5350 Campbells Run Road
Pittsburgh, PA 15205

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Park West Two
Cliff Mine Road
Pittsburgh, PA 15275
412-788-1080

1.

LABORATORY ANALYSIS REPORT

CLIENT NAME: ENGINEERING-SCIENCE, INC.
ADDRESS: 710 S. ILLINOIS AVE., SUITE F103
OAK RIDGE, TN 37830-0000

NUS CLIENT NO: 0734 0001

ATTENTION: MR. BILL HAYDEN

REPORT DATE: 01/25/89

VENDOR NO: 00795506
WORK ORDER NO: 55830

SAMPLE IDENTIFICATION: DANGB-10GW10-B-GW1 (P101431)
NUS SAMPLE NO: P0108296
DATE SAMPLED : 9/23/88
DATE RECEIVED: 19-JAN-89 Relog date/24-SEP-88 Received date
APPROVED BY: Joanne C. Simanic

<u>TEST</u>	<u>DETERMINATION</u>	<u>RESULT</u>	<u>UNIT</u>
R50	Tritium	< 2000	pCi/L

COMMENTS:



Laboratory Services Group
5350 Campbells Run Road
Pittsburgh, PA 15205

REMIT TO:
Park West Two
Cliff Mine Road
Pittsburgh, PA 15275

412-788-1080

1.

LABORATORY ANALYSIS REPORT

CLIENT NAME: ENGINEERING-SCIENCE, INC.
ADDRESS: 710 S. ILLINOIS AVE., SUITE F103
OAK RIDGE, TN 37830-0000

NUS CLIENT NO: 0734 0001

VENDOR NO: 00795506

WORK ORDER NO: 55830

REPORT DATE: 01/25/89

ATTENTION: MR. BILL HAYDEN

SAMPLE IDENTIFICATION: DANGB-10GW10-D-GW1 (F101432)

NUS SAMPLE NO: P0108297

DATE SAMPLED : 9/23/88

DATE RECEIVED: 19-JAN-89 Relog date/24-SEP-88 Received date

APPROVED BY: Joanne C. Simanic

<u>TEST</u>	<u>DETERMINATION</u>	<u>RESULT</u>	<u>UNIT</u>
R50	Tritium	< 2000	pCi/L

COMMENTS:

3231



Laboratory Services Group
5350 Campbells Run Road
Pittsburgh, PA 15205

REMIT TO:
Park West Two
Cliff Mine Road
Pittsburgh, PA 15275

412-788-1080

1.

LABORATORY ANALYSIS REPORT

CLIENT NAME: ENGINEERING-SCIENCE, INC.
ADDRESS: 710 S. ILLINOIS AVE., SUITE F103
OAK RIDGE, TN 37830-0000

NUS CLIENT NO: 0734 0001

VENDOR NO: 00795506

WORK ORDER NO: 55830

REPORT DATE: 01/25/89

ATTENTION: MR. BILL HAYDEN

SAMPLE IDENTIFICATION: DANGB-BG-SL5-SW1 (P101433)

NUS SAMPLE NO: P0108298

DATE SAMPLED : 9/23/88

DATE RECEIVED: 19-JAN-89 Relog date/24-SEP-88 Received date

APPROVED BY: Joanne C. Simanic

<u>TEST</u>	<u>DETERMINATION</u>	<u>RESULT</u>	<u>UNIT</u>
R50	Tritium	< 2000	pCi/L

COMMENTS:

DATA PACKAGE #67

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Page 1
Received: 03/01/89

ITRSL Oak Ridge
03/31/89 16:59:51

REPORT

Work Order # R9-03-013

REPORT ENGINEERING SCIENCE, INC.
TO 710 S. ILLINOIS AVE. STE. F 103
OAK RIDGE, TN 37830

PREPARED BY IT/RADIOLOGICAL SCIENCES LAB.
BY 1550 BEAR CREEK ROAD
OAK RIDGE, TN 37831

ATTEN JO ANN SHERWIN

ATTEN ERS
PHONE 615-482-9707

James T. Henney
CERTIFIED BY

CONTACT J HARVEY

CLIENT ENGSCI SAMPLES 4
COMPANY ENGINEERING SCIENCE, INC.
FACILITY

WORK ID WATER SAMPLES

TAKEN

TRANS

TYPE

P.O. #

INVOICE under separate cover

SAMPLE IDENTIFICATION

01 DANGB-10-GW10-C-GW2
02 DANGB-10-GW10-B-GW2
03 DANGB-10-GW10-A-GW2
04 DANGB-10-GW10-D-GW2

CALPHM GROSS ALPHA

GBETA GROSS BETA

RA226 RA-226

RA228 RA-228

TRI TRITIUM

TEST CODES and NAMES used on this report

Page 2
Received: 03/01/89

ITRSL Oak Ridge REPORT
Results By Test

Work Order # R9-03-013

TEST CODE default units	Sample 01 (entered units)	Sample 02 (entered units)	Sample 03 (entered units)	Sample 04 (entered units)
GALPHW pCi/l	72 +/- 41	85 +/- 50	382+/-154	154+/- 65
GBETA pCi/l	92 +/- 45	211+/- 67	253+/-104	155+/- 57
RA226 pCi/l	<0.6	<0.6	<0.6	<0.6
RA228 pCi/l	<2.9	<2.4	<2.5	<2.5
TRI pCi/l	<339	<339	<339	<339

DATA PACKAGE #68

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CERTIFICATE OF ANALYSIS

PREPARED FOR: ENGINEERING-SCIENCE LABORATORY, INC. PN 135-04
600 BANCROFT WAY
BERKELEY, CA 94710

metaTRACE SAMPLE NUMBER: LISTED BELOW
DATE RECEIVED: LISTED BELOW
DATE ANALYZED: 9/20/88
METHOD: EPA 353.2
SAMPLING LOCATION: DULUTH ANGB

LAB NUMBER	SAMPLE IDENTITY	DATE RECEIVED	MATRIX	NITRATES	UNITS
AA17479	BG-MW43-GW-1	09/08/88	WATER	< 0.02	MG/L
AA17480	BG-MW50-GW-1	09/08/88	WATER	< 0.02	MG/L
AA17481	BR1	09/08/88	WATER	< 0.02	MG/L
AA17662	BG-MW42-GW-1	09/09/88	WATER	< 0.02	MG/L
AA17663	BG-MW32-GW-1	09/09/88	WATER	< 0.02	MG/L
AA18300	DANGB-2-MW2-GW-1	09/20/88	WATER	< 0.02	MG/L
AA18301	DANGB-2-MW1-GW-1	09/20/88	WATER	< 0.02	MG/L

CHAIN OF CUSTODY RECORD

[illegible]

CHAIN OF CUSTODY RECORD

3243

[illegible]

PAGE 1 OF 1

DATE 9/8/88

PROJECT NO. 135-04

SAMPLE ARRIVAL DATE 9/8/88

EXPECTED NO. OF SAMPLES 3

EXPECTED MATRIX Asker

CLIENT Engineering Science

PROJ. MGR. J. Carter

SHIPPER

DUE DATE 9/30/88

DISTRIBUTION

AUTO ✓

ICAP

I-PREP

O-PREP

GC

GCMS

RAD

PROJ. MGR. ✓

OTHER

(REVISED 5/84)

ORIGINAL ✓

REVISION

STORAGE/LOCATION SIS

SAMPLE NO.

SAMP ID &

DESCRIPTION

SAMPLE DATE

MATRIX

CONTAINER/
PRESERVATIVE

LOT #

ANAL
CODE

SPECIFIC
METHOD

Dibazole Nitrate
Cadmium Reduction

OT p 1/1

✓

✓

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✓

✓

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CHAIN OF CUSTODY RECORD

3247

metaTRACE, Inc.

SAMPLE ARRIVAL NOTIFICATION/LABORATORY CHAIN OF CUSTODY

(REVISED 3/78)

ORIGINAL

REVISION

STORAGE/LOCATION

53B

DISTRIBUTION

AUTO

ICAP

ପଦ୍ମ-୧

344

500

GRAD

PROJ. MGR.

OTHER

CLIENT Ernst & Young Securities

PROJ. MGR. W. H. H. H.

SHIPPER Ed W

DUE DATE 9/27/88

SAMPLE NO.

SAMP ID &

DESCRIPTION

SAMPLE DATE

MATRIX

3
LOT 1

107

CONTAINER/
PRESERVATIVE

ANAL CODE	SPECIFIC METHOD
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97	97
98	98
99	99
100	100

AT pD₂/m

Extracellular matrix
Pedonium Reduction

3248

DISPOSAL

NORMAL

HAZARDOUS

DATE TO DISPOSE

PM SIGNATURE

CHAIN OF CUSTODY RECORD

[illegible]

3249

1945035M361

ORIGINAL _____
 REVISION _____
 STORAGE/LOCATION _____

✓
DISTRIBUTION
AUTO
ACAP
I-PREP
O-PREP
GC
GCMS
RAD
PROJ. MGR.
OTHER

CLIENT Engineering Science Co.
 PROJ. MGR. J. Parker
 SHIPPER Ed. H.
 DUE DATE 9-22-88

SAMPLE NO.	SAMP ID &	DESCRIPTION	SAMPLE DAT	MATRIX
------------	-----------	-------------	------------	--------

AM18300	NA18301
DANG B-2	DANG B-2
MWZ	MWZ
Gw-1	Gw-1
9/19/88	—
WATER	—
✓	✓

CONTAINER/
PRESERVATIVE

LOT 1

CONTAINER/
PRESERVATIVE

CONTAINER/
PRESERVATIVE
DOT, PLASTIC

SPECIFIC METHOD

ANAL
CODE

H353.2
Yttride / Yttride
Yttrium Oxide

DR. PLASTIC

3250

DISPOSAL

NORMAL

HAZARDOUS

DATE TO DISPOSE

PM SIGNATURE

COMMENTS

[illegible]

FEDEX
EXPRESS

AIRBILL
USE THIS AIRBILL FOR DOMESTIC SHIPMENTS WITHIN THE CONTINENTAL U.S.A., ALASKA AND HAWAII.
USE THE INTERNATIONAL AIR WAYBILL FOR SHIPMENTS TO PUERTO RICO.
QUESTIONS? CALL 800-238-3555 TOLL FREE.

9490314223

PACKAGE TRACKING NUMBER 9490314223

SENDER'S COPY

Sender's Federal Express Account Number 1196-4207-8		Date 11/11	
From (Your Name) Please Print Kearney, Inc.		To (Recipient's Name) Please Print Kearney, Inc.	
Company Kearney, Inc.		Company Kearney, Inc.	
Street Address 210 W. Illinois Ave.		Exact Street Address (We Cannot Deliver to P.O. Boxes or R.F.D. Zip Codes) 13712 Parker Road North	
City Oak Ridge		City Ft. Smith	
State TN		State AR	
ZIP Required 37830		ZIP Required 72304	
YOUR BILLING REFERENCE INFORMATION (FIRST 24 CHARACTERS WILL APPEAR ON INVOICE) 1196-4207-8			
PAYMENT <input checked="" type="checkbox"/> Bill Sender <input type="checkbox"/> Bill Recipient's FedEx Acct. No. <input type="checkbox"/> Bill 3rd Party FedEx Acct. No. <input type="checkbox"/> Bill Credit Card <input type="checkbox"/> Cash			
SERVICES 1 <input type="checkbox"/> PRIORITY 1 Over-night Delivery 2 <input type="checkbox"/> COURIER-PAR OVERNIGHT ENVELOPE 3 <input type="checkbox"/> OVERNIGHT BOX 4 <input type="checkbox"/> OVERNIGHT TUBE 5 <input type="checkbox"/> STANDARD AIR Delivery (not next business day) 6 <input type="checkbox"/> OVERNIGHT LETTER*		DELIVERY AND SPECIAL HANDLING 1 <input type="checkbox"/> HOLD FOR PICK-UP # is this in 2 <input checked="" type="checkbox"/> DELIVER SATURDAY # is charge 3 <input type="checkbox"/> DELIVER SATURDAY # is charge 4 <input type="checkbox"/> DANGEROUS GOODS # is charge 5 <input type="checkbox"/> CONSTANT SURVEILLANCE SERVICE (CSS) # is charge 6 <input type="checkbox"/> DAY ICE # is charge 7 <input type="checkbox"/> OTHER SPECIAL SERVICE 8 <input type="checkbox"/> SATURDAY PICK-UP # is charge 9 <input type="checkbox"/> HOLIDAY DELIVERY # is charge 10 <input type="checkbox"/> HOLIDAY DELIVERY # is charge 11 <input type="checkbox"/> HOLIDAY DELIVERY # is charge 12 <input type="checkbox"/> HOLIDAY DELIVERY # is charge	
RECEIVED AT 1 <input type="checkbox"/> Regular Stop 2 <input type="checkbox"/> On-Call Stop 3 <input type="checkbox"/> Drop Box 4 <input type="checkbox"/> BSC 5 <input type="checkbox"/> Station 6 <input type="checkbox"/> FEDEX Card Employee No.		SERVICE CONDITIONS, DECLARED VALUE AND LIMIT OF LIABILITY Use of this label constitutes your agreement to the service conditions in our current Service Guide which is available upon request. See back of sender's copy of this label for further information. We will not be responsible for any claim in excess of \$100 per package, whether the result of loss, damage, delay or non-delivery. If you insure your shipment for more than \$100, you must pay an additional \$100 per annum amount insurances found in the current Federal Express Service Guide. Apply your rights to recover from Federal Express for loss of the intrinsic value of the package, as well as for lost or damaged contents, income interest, profit, attorney fees, costs and expenses, up to the greater of \$100 or the declared value attached to the bill in no event shall your recovery exceed your actual loss. In the event of untimely delivery, Federal Express will at your request and with some limitations, refund transportation charges paid. See Service Guide for further information. Sender authorizes Federal Express to deliver this shipment without obtaining a delivery signature and shall indemnify and hold harmless Federal Express from any claims resulting therefrom.	
BASE CHARGES Declared Value Charge Other 1 Other 2 Total Charges		FEDERAL EXPRESS USE PART 1204178000 REVISED RATE 7/88 PRINTED IN U.S.A. GFE	

SENDER'S COPY 9490314223

CERTIFICATE OF ANALYSIS

PREPARED FOR: ENGINEERING-SCIENCE LABORATORY, INC. PN 135-04
600 BANCROFT WAY
BERKELEY, CA 94710

metaTRACE SAMPLE NUMBER: LISTED BELOW
DATE RECEIVED: LISTED BELOW
DATE ANALYZED: 9/21/88
METHOD: EPA 353.2
SAMPLING LOCATION: DULUTH ANGB

LAB NUMBER	SAMPLE IDENTITY	DATE RECEIVED	MATRIX	NITRATES	UNITS
AA18335	DANGB-2-MW37-GW-1	09/21/88	WATER	< 0.02	MG/L
AA18336	DANGB-2-MW41-GW-1	09/21/88	WATER	0.05	MG/L
AA18337	DANGB-2-GW2E-GW-1	09/21/88	WATER	< 0.02	MG/L
AA18338	DANGB-BR9	09/21/88	WATER	< 0.02	MG/L
AA18339	DANGB-2-MW40-GW-1	09/21/88	WATER	0.08	MG/L
AA18340	DANGB-2-MW55-GW-1	09/21/88	WATER	0.09	MG/L
METHOD BLANK	NA		WATER	< 0.02	MG/L
LAB CONTROL SAMPLE	NA		WATER	102	%

Chain-of-Custody

3255

CERTIFICATE OF ANALYSIS

PREPARED FOR: ENGINEERING-SCIENCE LABORATORY, INC. PN 135-04
 600 BANCROFT WAY
 BERKELEY, CA 94710

metaTRACE SAMPLE NUMBER: LISTED BELOW
 DATE RECEIVED: LISTED BELOW
 DATE ANALYZED: 9/23/88
 METHOD: EPA 353.2
 SAMPLING LOCATION: DULUTH ANGB

LAB NUMBER	SAMPLE IDENTITY	DATE RECEIVED	MATRIX	NITRATES	UNITS
AA18469	DANGB-BR10	09/22/88	WATER	< 0.02	MG/L
AA18470	DANGB-2-GW2A-GW1	09/22/88	WATER	< 0.02	MG/L
AA18471	DANGB-2-MW56-GW1	09/22/88	WATER	< 0.02	MG/L
AA18472	DANGB-2-GW2C-GW1	09/22/88	WATER	0.86	MG/L
AA18473	DANGB-2-MW4-GW1	09/22/88	WATER	0.53	MG/L
AA18474	DANGB-2-GW2D-GW-1	09/22/88	WATER	< 0.02	MG/L
AA18475	DANGB-2-MW39-GW-1	09/22/88	WATER	0.52	MG/L
METHOD BLANK	NA		WATER	< 0.02	MG/L
LAB CONTROL SAMPLE	NA		WATER	101	%

Chain-of-Custody

Client: Engineering Science

Project No: 135-04

Due Date: 10-6-88 . Report To: Ashkel

Date Received: 9-22-88

Received By:

Sample Location:

[illegible]

CERTIFICATE OF ANALYSIS

PREPARED FOR: ENGINEERING-SCIENCE LABORATORY, INC. PN 135-04
600 BANCROFT WAY
BERKELEY, CA 94710

metaTRACE SAMPLE NUMBER: LISTED BELOW
DATE RECEIVED: LISTED BELOW
DATE ANALYZED: 9/23/88
METHOD: EPA 353.2
SAMPLING LOCATION: DULUTH ANGB

LAB NUMBER	SAMPLE IDENTITY	DATE RECEIVED	MATRIX	NITRATES	UNITS
AA18641	DANGB-2-MW7-GW1	09/23/88	WATER	< 0.02	MG/L
AA18642	DANGB-2-MW6-GW1	09/23/88	WATER	0.14	MG/L
AA18643	DANGB-2-MW5-GW1	09/23/88	WATER	< 0.02	MG/L
AA18644	DANGB-2-MW38-GW1	09/23/88	WATER	< 0.02	MG/L
AA18645	DANGB-2-GW2B-GW1	09/23/88	WATER	< 0.02	MG/L
METHOD BLANK	NA		WATER	< 0.02	MG/L
LAB CONTROL SAMPLE	NA		WATER	102	%

CERTIFICATE OF ANALYSIS

PREPARED FOR: ENGINEERING-SCIENCE LABORATORY, INC. PN 135-04
600 BANCROFT WAY
BERKELEY, CA 94710

metaTRACE SAMPLE NUMBER: LISTED BELOW
DATE RECEIVED: LISTED BELOW
DATE ANALYZED: 10/04/88
METHOD: EPA 353.2
SAMPLING LOCATION: DULUTH ANGB

LAB NUMBER	SAMPLE IDENTITY	DATE RECEIVED	MATRIX	NITRATES	UNITS
AA18865	DANGB-BG-SL5-SW1	09/24/88	WATER	0.69	MG/L
AA18866	DANGB-BG-SL4-SW1	09/24/88	WATER	0.10	MG/L
AA18867	DANGB-BG-SL25-SW1	09/24/88	WATER	0.07	MG/L
AA18868	DANGB-BG-SL1-SW1	09/27/88	WATER	0.09	MG/L
AA18869	DANGB-BG-SL2-SW1	09/27/88	WATER	0.04	MG/L
AA18870	DANGB-BG-SL3-SW1	09/27/88	WATER	0.74	MG/L
AA18871	DANGB-2-SL7-SW1	09/27/88	WATER	0.04	MG/L
AA18872	DANGB-2-SL6-SW1	09/27/88	WATER	0.04	MG/L
AA18873	DANGB-2-SL29-SW1	09/27/88	WATER	< 0.02	MG/L
METHOD BLANK	NA		WATER	< 0.02	MG/L
LAB CONTROL SAMPLE	NA		WATER	92	%

metaTRACE, Inc.

Chain-of-Custody

client: ENGINEERING SCIENCE

Project No: 135-04

Due Date: 0-5-08 Report To: ASH/BJ

Date Received:

Received By:

Sample Location:

[illegible]

32F3

CLIENT Engineering Services
 PROJ. MGR. J. Parker
 SHIPPER Ed En
 DUE DATE 10-17-88

(REVISED)

ORIGINAL

REVISION

STORAGE/LOCATION
R2D

DISPOSAL

NORMAL

HAZARDOUS

DATE TO DISPOSE

PM SIGNATURE

COMMENTS

metaTRACE, Inc.

Chain-of-Custody

client: ENGLEBORG SELBY

Project No: 135-04

Due Date: 10-17-88

Report To: Asst

Date Received:

9/27/88

Received By:

Sample Location:

[illegible]

Client: ENGINEERING SOLUTIONS

Date Received: _____

9/27/03

Project No: 135-04

Received By:

2017

Due Date: 10-17-03

Report To: AS H&D

Sample Location: R2D

[illegible]

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